GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXVI., No. 3315.] WEDNESDAY, DECEMBER 1, 1926. [78TH YEAR.

EDITORIAL NOTES.

Getting Out of the Mess.

THE seven months' coal stoppage is practically at an end. It has been the longest coal strike on record, and the most wretched and foolish ever witnessed. It has been costly in money, waste, and misery—not only to the mining industry, but to the country and everybody in it. To the miners, who have lent themselves to this revolt against common sense (with political motives in the background), the stoppage has done infinite harm, from which it will take a long time to recover. But, though it has been costly and harmful, it is probable that it will prove to be a blessing in disguise. The coal stoppage and the general strike have shown that strikes as a means of enforcing obedience to the wills of the extremists in the trade unions are out of joint with the conditions of today; that a big strike engulfs industrial workers generally in its effects; and that the desires of the trade unions must be governed by the economic circumstances of the times, and not by the wills of the blatant extremists whom they have unfortunately admitted to their counsels, and who were the chief instigators of the catastrophes of this year. There are lessons in these happenings which will have good issue, and will not contribute to any longing for a repetition of them. The greatest lesson of all is that the nation is stronger than any part of it.

Out of the great coal strike the Miners' Federation have emerged thoroughly discredited; and the leaders are not now particularly anxious to come out into the limelight. The finger of scorn is being pointed at them; for their conduct throughout has been the antithesis of diplomatic, and folly and unintelligence have led them. After struggling the last two or three weeks with the circumstances they had themselves created, in the hope of getting a veneer of credit with which to meet their dupes, the Federation Executive finally threw up the sponge last Friday, and left the districts to get out of the Federation organized mess the best way they could. At the same time the pantaloon of the piece blazoned it abroad that the Federation (which is Mr. Cook and satellites) would not ratify any agreement that involved longer hours. He has often said before that neither he nor Mr. Herbert Smith would set their signature to any agreement containing longer hours. It is not likely that Mr. Cook will be asked to sign anything. And as to Mr. Smith—even while Mr. Cook was making the boast which suggested the Federation was still an embodiment of power, and its ratification an essential—the Federation President was negotiating for the Yorkshire men on a seven-and-a-half hour basis. As a matter of fact, in Mr. Smith's own territory there are several pits which have been working eight hours for some weeks, and without as much as "by your leave" to Mr. Smith. In Nottinghamshire 90 p.ct. of the men resumed work under a seven-and-a-half hours' agreement negotiated by Mr. G. A. Spencer, M.P., without reference to the Federation hide-bound local Association; and it has a duration of five years. In Lancashire a three years' agreement has been settled on the basis of an eight-hour day on April pay. These sane settlements knock on the head the "guiding principle" of the Miners' Federation that agreements should be terminable by one month's notice from either side. That is a condition the Federation would have liked, to enable them to make a further early and sharp essay to realize their objective. Longer hours are part of the terms in every district; and we are confident a majority of the miners will have no objection to a guarded period of peace after the senseless seven months' idleness that they have had, with all the terrible waste involved, and the serious setback which has been occasioned by it to the return to prosperity of the country. By the end of the week settlements had been made in Nottinghamshire, Scotland, Lancashire and Cheshire, Derby, Warwickshire, and Northumberland. A three years' agreement was effected on Monday in Yorkshire—Mr. Herbert Smith's territory! It provides for a seven-and-a-half hours' day, but no change in Saturday shifts, with pre-stoppage rates of pay until the end of February; thereafter, on the results of the working of the industry.

By last Saturday there were at work some 450,000 men; and official advice was given to the remainder, or as many of them as are wanted, to resume work immediately the agreements have been made, and the approval of the men has been given. It was calculated that the output from the mines last week would be approximately 2,000,000 tons. There is full liberty now to trade in coal at home; but, at the time of writing, the limitations have not been removed in respect of coal for abroad. Inquiries, however, are already being made from several quarters, where there is anxiety to revert to the British qualities. It is, of course, highly essential that home requirements should receive primary attention. We are entitled to first call on our native supplies; and the country has had to bear the financial burden of the stoppage, as well as the heavy subsidy which preceded it. But even at home there must be no scrambling for the purpose of creating large stocks—prices perhaps will curb eagerness in that respect; and a heavy demand will not ease them. Special care must therefore be taken by all buyers not to pursue a course which would produce unpleasant penalties.

Points from the Tar Conference Papers.

THE Tar Conference which was held in Manchester last Friday, under the auspices of the Society of Chemical Industry (Fuel and Manchester Sections), the Institution of Gas Engineers, and the Coke-Oven Managers' Association, has resulted in a mass of material of imposing current value. Research into tars for the recovery of their commercial properties has been freely made over a long course of years; but investigation into tars in relation to their production and application has not been carried out so thoroughly. The papers presented at the conference show, however, that many workers are applying themselves to explorations, and that knowledge is expanding in the directions in which more enlightenment is urgently required. The urgency has been brought about by changes—changes in carbonizing methods, and consequently change in the chemical and physical characteristics of tar, which require differences in treatment to ensure suitability for given purposes. Attacks have been made upon tar in connection with its application to the making and surfacing of roads; and allegations have been freely preferred concerning it in respect of the destruction of fish life. Vertical retort tar pitch has been arraigned on the ground of inferiority as a binder for briquette mak-

ing. The charges can only claim validity if there is not proper treatment of the tar; with correct treatment, the validity disappears. The method of carbonizing, temperatures employed, free space in the retorts, character of the coal, and even its size are conditions which play their respective parts in producing variation of the constitution of tars. It is because the past few years have seen a gradual enlargement of the adoption of new conditions in carbonization, and so have put upon the market larger volumes of tar with distinct differences from the old horizontal retort product, that it has become more and more essential to investigate and adapt to meet requirements—and adaptations come mostly within the province of the distiller.

At the time of writing, we have before us the papers presented at the conference, but not the report of the discussions. In this issue of the "JOURNAL," a first instalment of the communications is being published, together with the discussion to which they gave rise. We have not the slightest doubt that not all of the submissions made in the prepared subject-matter will receive universal endorsement. In this article, our intention is merely to emphasize some of the points advanced.

The large area there is for scientific investigation into tar problems was well illustrated by the papers read at the morning session. One of them, entitled "A Study of the Tars and Oils Produced from Coal," was by Mr. F. S. Sinnatt, Dr. J. G. King, and Mr. W. H. Linnell. A plea was made by Mr. W. Gordon Adam for "Standardization of Analytical Methods in Coal Tar Products Specifications;" while Mr. H. M. Spiers dealt with the "Variation of the Hutchinson Consistency of Tars with Temperature," and the "Consistency of Bitumen Mixtures." The papers show that those who are making exploration into tar have had impressed upon them the need of something being done to bring about, by the standardization of methods, more co-ordination in carrying out the work. If results from different quarters are to be relative, this is highly necessary, although it is equally essential that detailed information should accompany such work regarding the carbonization conditions under which the tar is produced, as well as an analysis of the coal from which it is derived. This was emphasized at the very beginning of the proceedings. In the first paper—that by Mr. Sinnatt and his colleagues—which treated of investigations carried out to determine the effect on the composition of low-temperature tar of the nature of the process of carbonization and of the coal used, the authors warned their hearers that the low-temperature tars which are at present being examined are not necessarily of the type which will ultimately be available in bulk. It is probable that, under ordinary working conditions, the bulk of the tar available in future will be that produced under conditions which do not give either the highest yield or the best quality.

In the course of papers in the afternoon strong emphasis was also laid on the point regarding the variation (under high-temperature conditions) of the characteristics of tar due to the processes of carbonization—whether operating with horizontal retorts, continuous vertical retorts, or the latter with the charges undergoing steaming—and those are not the only points which must have consideration. This was seen particularly in a paper on "Notes on Vertical Retort Tar," by Mr. J. Macleod, in collaboration with Mr. C. Chapman and Mr. T. A. Wilson. Their experience was obtained with the Glasgow vertical retort plant. From it, it is apparent that the conditions of production materially affect the resultant tar; the primary consideration being the temperature zoning. The influence of temperature upon the tar is governed by the extent of the heated surface with which the gases and vapours come into contact. Thus, the amount of free space in a retort and the rapidity of exhausting the gases affect the yield of tar; and, from chemical comparison of various tars, it is obvious that the processes yielding the lower qualities of tar are those in which prolonged exposure to high temperatures has occurred, with consequent cracking of the more aromatic hydrocarbons. Of course, change in the type of coal dealt with in any system of carbonization also results in an altered tar composition. As was shown in this paper, and in one by Mr. M. Barash, vertical retort tar (which differs considerably in constitution and value from the old type of horizontal retort tar) has necessitated some reconsideration on the part of distillers of the methods of refining. But everything considered, both papers submit that vertical retort tar has many advantages over other tars from the distillers' point of view—the total value of the derivatives being higher, and refining easier and cheaper, except in the case of the tar acids. The reason for this is, as Mr. Barash noted, that the tar produced in continuous verticals is constantly passing from the zone in which it is produced into a cooler one, so that the minimum of cracking or degradation takes place. He also mentioned that several large refiners have stated that they definitely prefer vertical retort tar to any other tars, that the yields and value of the distillates are considerably higher, and that the preparation of tar products from the tar presents no difficulty. The point is further emphasized by Dr. A. Parker, in his paper on "Some Observations on Coal Tars from Steamed Vertical Retorts." Tars from continuous vertical retorts, through the less degradation to which they are exposed than in horizontal retorts, he classes as intermediate between high-temperature and low-temperature horizontal retort tars. He also shows how the size of coal and steaming in vertical retorts affect tar production—the steaming contributing to the reduction of secondary decomposition of the tars by removing them rapidly from the retorts, and by ensuring more uniform heating of the coal as it descends.

The higher content of free carbon in horizontal retort tar was dealt with in a paper by Mr. H. Hollings, who treated of the influence of carbonizing conditions upon this particular content of tar. The importance of this subject is shown by the fact that the free carbon content governs to a marked degree the quality of pitch for briquetting purposes, and of the dehydrated tar for road purposes, as well as providing an index of other properties of the tar; and, within limits, there is a relationship between the free carbon content and the yield of tar per unit of coal. In this paper there is again emphasized the need for greater scientific investigation into tar problems; Mr. Hollings pointing out that, while it is known that relatively large quantities of free carbon are symptomatic of relatively high temperatures and large free space within the retort, there is little information available as a basis for the evaluation of the relative importance of such factors. Therefore, he submits that a really scientific study of the matter is required. But it presents many difficulties; and owing to the complexity of the reactions involved, he is afraid some years must elapse before such a scientific study can be made. From his empirical experiments, however, he shows conclusively that, as the weight of charge per unit of space is reduced, there is a progressive increase of free carbon in the tars; also that, as a reduction of temperature is made, it has the effect of diminishing the free carbon. Consideration of his figures leads to the conclusion that, with any given retort, the most important factor affecting the quality of tar is the relative weight of each charge of coal placed in the retort. While the influence of temperature is by no means negligible, it is obvious that, to attempt to improve the quality of an unsatisfactory tar by diminishing the combustion chamber temperature, would necessitate a reduction of temperature below that which is required for the maintenance of the coal throughputs necessary for economic working.

In view of the controversy as to relative merits which has occurred in connection with the competition of bitumen with tar for road purposes, followed by a fairly general acceptance of the view that, in order to meet the requirements of road surveyors, the specification for road tar requires some amendment, it was only to be expected that at this conference a great deal of attention would be devoted to the subject of the preparation of tar for road application. The expectation was fulfilled. Probably the most important contribution to the subject was made by Mr. W. Gordon Adam, in a paper on "Distilled Tar for Roads." In this he submitted a specification that—in his opinion, which may not be endorsed by all tar producers and users—may be relied upon to give a first-class article, well worth its extra cost, although it may be difficult to bring within its

limits the product of every variety of the raw material. So satisfied is Mr. Adam with the specification (which is given in his paper in this issue) that he suggests it should be embodied by every surveyor in every tender form calling for refined tar, for any but the most temporary and cheap repair work. It is observed from the same paper that what should prove to be valuable experiments on the effect of tar constituents on fish life are now being conducted at Beckton. It is without doubt that the gas industry is losing no opportunity for protecting its interests in respect of this important secondary product. Mr. Adam also discusses the need for a revision of our methods of tar sales, in order to stabilize the use of road tar by surveyors. The heavy fluctuations in the prices of tar make it difficult for them to prepare estimates well in advance of the work to be carried out; and he therefore advocates some form of central marketing agency which would standardize or stabilize prices independently of the fluctuations of pitch or other markets. His view that the outlook for the use of tars on roads is better than it ever was is highly satisfactory. Tar producers must ensure that the outlook materializes.

In connection with road use, the increasing production of vertical retort tar has to be taken into account. For the purpose of road use, as Mr. Barash points out, better recognition must be made than has hitherto been the case that the preparation of such tars should not necessarily be on all-fours with the conditions applying to the older forms of tars obtained by the horizontal system. It has not yet been universally recognized that simple dehydration, and removal of the light oils simultaneously distilling over with the water, do not lead to the production of a suitable tar for road purposes from vertical retort tars. Further heat treatment is necessary, because of the low consistency of the tars; and, by carrying the distillation to a sufficient degree, perfectly efficient road tars are obtainable.

Having regard to the controversy there has been with the makers of briquettes concerning vertical retort tar pitch, it will be interesting to the producers to find in the papers so much that is destructive of the complaints of its inferiority for binding purposes in briquette making. The experience which the Glasgow Corporation Gas Department have had, as related by Mr. Macleod and his collaborators, is a strong indication that the allegations on this subject have no real foundation. It would be very useful if a test could be devised, as suggested by Mr. Frankland Taylor, which would indicate the briquette-making efficiency of any particular pitch—that is to say, the binding power and elasticity.

We are confident that the conference has made an excellent contribution, or put us well on the road, to the solution of tar problems which are of considerable moment to both producers and users. For this contribution, the organizers of the conference, and all who took part in it, are to be heartily thanked.

Sulphate of Ammonia Developments.

LOOKING back only a few years, we are reminded of the somewhat light-hearted manner in which many men connected with bye-product sulphate of ammonia viewed the advent of the synthetic product. It passed their comprehension that the new competition should assume any material proportions; but year by year the views which then possessed such makers, but were not shared by the more perceptive, have receded into the background as the synthetic product has grown into a larger and larger factor in the world's fertilizer markets. To-day the synthetic product is predominant among the fertilizers, and rules market values. The address which the Chairman of the British Sulphate of Ammonia Federation, Ltd. (Mr. D. Milne Watson), delivered at the Sixth Annual Meeting was remarkably informative concerning the position. A world's increase during the past year of nearly 8½ p.ct. in the consumption of all forms of nitrogen is good; but the whole of this has been satisfied by the greater output of synthetic nitrogen. Not only has it succeeded in meeting the extra demand, but it has displaced Chilean nitrate of soda to the extent of about 38,000 tons of pure nitrogen, which is equal to close upon 250,000 tons of nitrate. But these figures do not convey so much to those seeking information as to the actual position as do others which were supplied by the Chairman. The synthetic article, he tells us, now supplies about 47 p.ct. of the world's demands; and bye-product nitrogen—chiefly in the form of sulphate of ammonia—accounts for 27 p.ct., while Chilean nitrate has possession of the other 26 p.ct. Another important fact which has to be reckoned with is that not only is synthetic nitrogen the dominant factor as far as price fixing is concerned, but as Germany produces about 70 p.ct. of the world's output of the synthetic product, it is the German price which governs the market. To ensure the market for their output, the German producers last year reduced their price by about 10 p.ct.; and naturally British producers had to follow suit, by making a further reduction of about 8 p.ct. in their prices for the current season. The result of this is that the British farmer is paying for sulphate of ammonia about £1 per ton less this season than he was doing a year ago. The loss to the producers is therefore a gain to the land; but there is little satisfaction in this to the former, with manufacturing costs so high. The data point to the fact that, despite the criticism, opposition, and difficulties to which the Federation Committee were at one time exposed in respect of their policy, what they did progressively (from their exploration of prevailing and prospective conditions) was sound and correct.

From time to time there have been rumours of some arrangement being effected between producers of Chilean nitrate and the makers of other forms of nitrogen. Mr. Milne Watson dealt with this; but there is no occasion for us to dwell upon it here, for the simple reason that there is not a shadow of truth in the suggestion. It is, however, clear that there is still a great deal of work to be done in disposing finally of the theory which obtains in some quarters, that nitrate of soda, being a natural product, has some mysterious virtues which, in all circumstances, make it a superior form of nitrogen. It is not so; but it is highly important that users of fertilizers of any description should get a proper appreciation of the relative merits of each. As the Chairman suggests, it is also important that the question as to which fertilizer is the best under given climatic conditions must be determined, first, by scientific agriculturists, and, secondly, by the relative economic value of all the fertilizing elements required to produce the most profitable result under given conditions. It is likely that good effect in this respect will arise from such conferences as the international one which was held at Biarritz. There was no question at that conference of price-fixing for fertilizers; but there was an honest attempt to take an intelligent survey of the whole position of the fertilizer industry, with the view of shaping for it a future course along the most successful and profitable lines, alike for producer and consumer. An observation of great importance was made by the Chairman when he said that the most learned members of the conference admitted that we are only on the threshold of knowledge in regard to fertilizers and their use in agriculture. This should stimulate all the great fertilizer industries, and especially the nitrogen industry, to pursue scientific research into these problems relentlessly, lavishly, and continuously. Those words should have due weight imported into them, in view of the data given in the earlier part of this article.

The position also provided strong support for the acceptance at this meeting of a scheme put forward by the Committee to expand the limits of the organization by founding an auxiliary Company, which will be known as Nitram Limited. The scheme was adopted without a dissentient vote, which shows that to the members of the Federation its intrinsic value appeals strongly; and it illustrates the firm confidence which the past has engendered among the members in the counsel and policy of those to whom they have committed the originating and carrying through of developments which promise successful issue. The formation of the auxiliary Company does not mean that the Federation has been a failure. Far from it. The Federation itself is a development from past conditions; the new Company is a development from the Federation which would not have been possible without the existence of the latter. Moreover, it is not proposed that the Federation shall discontinue its particular functions within the ambit of its constitution. What

Nitram Limited will do is to undertake the larger aims and powers for which the Federation has paved the way. The scheme will provide capital which the Federation lacks, also adequate expenditure for propaganda and administration; but will limit contribution by bye-product members of the Federation to the maximum of 3s. per ton of production. It will also give the members of the Federation four years' practical trial in which to observe for themselves either its merits or its disadvantages. It creates a selling organization which, it is believed, will in time profoundly affect the whole fertilizer position in this country. The limitation under which the Federation operates in respect of sulphate of ammonia will be removed; for Nitram Limited will be in the position to sell any kind of fertilizer required by British farmers. Thus it will invest the makers of bye-product sulphate of ammonia with a very important place in the conduct of fertilizer sales and propaganda, which will be, the Chairman is confident, beneficial to both producers and consumers. It should be remarked that there is really nothing original about this scheme; but it is a strong recommendation that it brings the bye-product producers of fertilizers on a level with other countries—similar bodies being already in existence in Germany, France, Italy, and Belgium. Good work is being done by the Federation in developing the uses of sulphate of ammonia, and in convincing the British farmer regarding its virtues. But we have to remember that crops and soils vary, and each fertilizer has a proper place in the scheme of agriculture. To educate the farmer up to correct choice and application is work which, we are sure, will be carried out in future with the fidelity on the part of the staff which has always characterized the operations of the Federation.

District Associations and Gas Students.

WE believe that, if the District Associations generally, the members of which can do more regionally than a national organization, took up seriously the question of encouraging the young men of the industry to enter upon study under the Institution educational scheme, and qualify for examination in "Gas Engineering" or "Gas Supply," there would not then be the complaint from certain important educational centres that there is so little demand for the courses that they would not be justified in incurring expenditure in organizing them and providing the necessary equipment. The editorial article, headed, "Where are the Students?," in our issue for the 17th ult., proved conclusively that there are technical educational centres which would gladly make the necessary arrangements for courses if they had the encouragement of a supply of students.

In our "Correspondence" columns last week, Mr. Octavius Thomas showed, by the example of the Wales and Monmouthshire Institution of Gas Engineers and Managers, that it is within the power of the District Associations to do much to remedy the grievance, and to perform a vast service not only to the young men of the industry, but to the future of the industry itself, by actively interesting themselves in this matter of the supply of students. The Welsh Institution have cut their own furrow along which they seek to co-operate with the technical educational centres; and if in such a difficult part of the country success in this regard can be achieved, then, in quarters in which there is a greater density of gas undertakings and travelling facilities are easier, there is no reason why a fuller success should not be realized. Not only do the Welsh Institution keep in touch with the college authorities, but they present prizes to those juniors who pass in the different branches of study. The details can be obtained from Mr. Thomas's letter. Moreover, when a junior passes the higher grade in either "Gas Engineering" or "Gas Supply," he is immediately entitled to membership of the Institution. It is by the reward process of encouragement that the Welsh Institution work to make a success of the industry's educational scheme; but at the back of that collective effort, we also see the influence of the individual encouragement of the members to the juniors whose professional destinies they are helping to shape. The question sometimes crosses the mind as to whether we always remember our duty and responsibility in this regard. The view may be ventured—let us speak bluntly—that the junior members of the gas industry are not such fools as to be oblivious of the value to them of fundamental technical knowledge, and, through it, of winning a place in the regard of their seniors. But if their seniors are listless, and neither offer encouragement nor use their influence to obtain for them the facilities required—well, things will go on in many places much in the same old way, to the detriment of not inconsiderable parts of the industry. Some of the students in Wales who have taken the technical educational courses have, Mr. Thomas tells us, received higher appointments in their own undertakings or in other parts of the country. The examples and the results are having a stimulating effect on other juniors. They have all something for which to thank the Welsh Institution.

Cannot the other District Associations make this question of closer co-operation with the technical educational institutions their concern, in the same successful way as the Welsh Institution? The matter is one for their decision.

Fuel, Fog, and Smoke.

ATMOSPHERICALLY, last week was a gloomy one owing to the fog which prevailed almost generally throughout the country, though some districts received less attention from the disagreeable visitor than others. In the midst of it came a ray of sunshine, in the shape of the welcome intelligence (first imparted to the House of Commons by Col. Lane-Fox, Secretary of Mines) that from last Thursday all restrictions in relation to coal supplies—except exports—would be withdrawn, which meant that freedom would be restored to consumers and the coal trade, and that collieries would again have power to dispose of coal as they pleased in this country, subject to the fulfilment of any allocations made by the District Committees. The restrictions on the use of gas and electricity for lighting, heating, and power were also withdrawn; and, from the end of the week, domestic consumers have been able to patronize these commodities to any extent they please. During the coal stoppage, a large business has been done in oil-stoves for heating and cooking; and these will doubtless now find their way into the domestic lumber room. But the big connection, beyond normal increases, of gas-cookers, gas-fires, and water-heaters attributable to the coal stoppage will remain, and be a permanent benefit to both gas suppliers and users, to the disgust of retailers of household coal.

Regarding the prevalent fog last week, naturally it had a tremendous influence on the demand made upon gas undertakings. But, unfortunately, just when most inconvenient, it had rather a bad effect on the transport of coal; and in some cases coal getting had to be temporarily abandoned, owing to the impossibility of obtaining a sufficient supply of wagons. By the end of the week, however, the fog cleared; and it is now hoped that normal conditions will enable the production of coal to proceed at the high level justly anticipated by the increased return of the miners, which increase made a total of about 450,000 men at work at the end of the week. There will be considerable advantage in getting back to the burning of British coal where gas and other smokeless fuel is not in use, in view of the fact that (according to Dr. J. S. Owens, the Hon. Secretary of the Advisory Committee on Atmospheric Pollution) the combustion of soft foreign coal creates more smoke; and thus, notwithstanding the smaller total use of domestic coal last week, the constituents of the fog showed no marked improvement.

Bearing on the last-mentioned subject, there was an interesting discussion, at one of the sittings of Standing Committee B (who have been considering the Smoke Abatement Bill), on the question of doing something to curtail the contribution made by domestic chimneys to the pollution of the atmosphere by smoke. In dealing with the clause which gives local authorities power to make by-laws respecting new buildings "other than private dwelling-houses," an attempt was made to omit the quoted words. It was held that it could be established that the domestic contribution to the smoke nuisance was upwards of 50 p.ct. Nevertheless, the endeavour proved abortive.

Mr. Neville Chamberlain appealed for a sense of proportion. The amendment, he submitted, could not be applied to dwellings already in existence, of which there are about 8 millions. Therefore, it could only govern those yet to be built, the number of which is approximately only about 200,000 a year. Moreover, a large proportion of these are fitted with modern grates, from which the emission of smoke is not such a serious matter as it was with the old-fashioned grates. In Mr. Chamberlain's view, the clause as it stands in the Bill carries out the recommendation of the Royal Commission, whose remedy for houses already in existence was rather in the direction of the promotion of the use of smokeless fuel. That may be true; but the clause in question is, after all, only a permissive, and not an obligatory, one; and the Legislature should place it within the power of local authorities to make, if they think fit, a start in the direction of reducing the contribution of dwelling-houses to the smoke pollution of the atmosphere by conferring the necessary authority in relation to new houses. However, it was agreed that, in the clause, the words "or cooking" should be added; and it therefore now reads as follows: "The powers of an "urban authority, under section 157 of the Public Health "Act, 1875, and of the London County Council under "section 164 of the London Building Act, 1894, shall ex-"tend to the making of by-laws requiring the provision in "new buildings, other than private dwelling-houses, of "such arrangements for heating or cooking as are calcu-"lated to prevent or reduce the emission of smoke." That is not a great improvement. It is very singular that the Government (while paying so much attention to the prevention of the pollution of our waterways, for the protection of fish life) should be so reluctant to help forward methods to promote a healthier condition of the atmosphere which would be beneficial to human beings. Example in new houses would do much to bring about voluntary reformation in the older ones.

National Conference on Service and Maintenance.

An important decision has been arrived at by the General Committee of the British Commercial Gas Association. They realize the great importance of arousing the whole industry to the urgency of the problem of the inspection and maintenance of consumers' appliances; and they have therefore decided, on the proposition of the Chairman of the Executive, that a National Conference on Service and Maintenance should be convened of the whole industry, and be held in London on Wednesday, Feb. 16 next. The Institution of Gas Engineers are to be invited to co-operate, in order that the engineering side of the question shall be fully considered. It is felt that the conference will provide a much-needed opportunity for the fuller discussion of many points on which gas managers who have not yet adopted any scheme are desirous of obtaining information, as well as an interchange of the views and experiences of those who have.

The Electricity Bill.

Last Wednesday the House of Lords gave second reading to the Electricity Bill, and referred it to a Committee of the Whole House. Reference to the proceedings is made in the opening paragraph of "Electricity Supply Memoranda" today.

Fuel from Roads.

The pressing want of domestic fuel was illustrated recently at the East Ham Police Court. At the present time, a new arterial road is being constructed through the district; and a youth was charged with stealing from it a quantity of coke. A representative from the Ministry of Transport informed the Bench that, during the past year, damage to the extent of something like £1000 has been caused by men, women, and children digging up and stealing the coke which forms part of the foundation of the road. They take sacks with them, and fill them with the results of their labours. On a previous Saturday morning, some 300 to 400 children were found going to the road for the express purpose of appropriating coke. The Bench were lenient with the offender before them, and, with a caution, let him go free. At the same time, it was suggested by them that a notice should be put up warning thieves of the danger they run.

Collateral Damage.

The coal stoppage appears to have had a disastrous effect on the income and membership of the National Union of General and Municipal Workers. Mr. Will Thorne, M.P., the General Secretary, in a report to the General Council, states that the amount of benefit paid since the commencement of the coal dispute has been approximately £234,000. Mr. Thorne adds that the cost of the dispute to the Union is not confined to, nor can it be measured by, the extent only of benefit paid. Thousands of the members are, as a consequence of it, entirely without work, while thousands are on short time. He estimates that the Union have 127,000 members thus affected; and something like 50,000 have had their contributions excused because of unemployment. The Union which Mr. Thorne represents is one of those the leaders of which are persuaded that the correct method of settling disputes is by constitutional means rather than by strikes which affect not only the workers immediately concerned in them, but spread their baneful influence far afield among workers in other industries.

Slightly Improved Employment.

The registers of the employment exchanges in Great Britain on Nov. 15 showed that the total number of persons seeking work through them was 1,551,500. This is less by 11,459 than the week before; but 355,263 more than in the corresponding week of last year. The figures are exclusive of persons who ceased work in the coal-mining industry through the dispute.

PERSONAL.

Mr. W. M. MASON's many friends in the industry will be glad to learn that his recent operation has been a complete success, and that he is now making good progress towards recovery.

The Directors of the Chester United Gas Company have appointed Mr. JOHN H. NOBLE to be Engineer and Manager, and Mr. H. HOPKINSON to be Secretary, in succession to the late Mr. Fred. A. Pye.

Mr. THOMAS H. PRATER, of the Isle of Thanet Gas Company, Margate, has been elected a member of the Society of Chemical Industry.

Councillor A. SUTCLIFFE has been elected Chairman of the Hebden Bridge and Mytholmroyd Gas Board, in succession to the late Councillor H. SUTCLIFFE, who was Chairman for many years.

Mr. E. HONORATUS LLOYD, K.C., has tendered his resignation as Recorder of Chester, a position which he has held since January, 1921. Five years ago, acting under medical advice, Mr. Honoratus Lloyd resigned from the Parliamentary Bar, where he had long been a leader.

OBITUARY.

RENÉ MASSE.

The French gas industry has lost a leader, and the Institution of Gas Engineers a highly respected member, by the death of M. René Masse, Vice-President and General Manager of the Société d'Eclairage, Chauffage, et Force Motrice.

M. René Masse was born in 1868, and was trained as a mining engineer; his early appointments being concerned with oil in Roumania and iron in Normandy. In 1892 he joined the old Paris Gas Company, and quickly rose to the top of that undertaking. Soon after the formation, in 1904, of the "E.C.F.M." for the supply of gas to the environs of Paris, M. Masse was given a seat on the board; and the wonderful development of that corporation was largely attributable to his powers of organization, his sound judgment, and his diplomacy. He was President of the Syndicat Professionel (the equivalent of our National Gas Council) from 1915 to 1920, and had been Vice-President of the Société Technique and of the Central Coke Committee. Outside the gas industry M. René Masse was a leading spirit in dye-stuffs industry, and was a member of the Paris Chamber of Commerce; and his public work had earned for him the ribbon of a Commander of the Legion of Honour. As a technical writer, too, he was held in high esteem in France; and recent works on "Carbonization" and "Bye-Products," in which he collaborated with M. Auguste Baril, were very well reviewed.

Members of the Institution of Gas Engineers remember well the courtly and kindly figure among their hosts in Paris in June, 1924.

We regret to learn, at the moment of going to press, that Mr. ROBERT W. WILSON, the late Secretary of the Imperial Continental Gas Association, died last Saturday.

ELECTRICITY SUPPLY MEMORANDA.

THE Electricity Supply Bill received its second reading in the House of Lords last week, and was referred to a Committee of the Whole House. Prior to this taking place, the Government were somewhat worried as to what would be the attitude of the Lords to the scheme. An urgent whip was issued to their supporters, and there was a loyal response. From beginning to end, the Bill has ridden through Parliament not on merit, but on the strength of the Government voting power. Two (Tuesday and Wednesday) sittings of the Lords were devoted to the debate. The motion for the second reading was submitted by Viscount Peel. Perusing the official report one is struck by the remarkable concurrence of the speakers on the Government side with all the fusty arguments in favour of the scheme, which have done duty so often. It is commonly overlooked that many of those who oppose the scheme do not deny the advantages of eventual concentration of generation, though the savings to be gained thereby are considerably over-rated, particularly in view of the increased obligations in respect of distribution and controlling machinery. The alleged electrical backwardness of our industrial areas was again put forward as an actual fact; but nothing, of course, can be more false, seeing that the manufacturing areas are well supplied, and at a price per unit which will compare with other countries—power prices, of course, being nothing like the 1·76d. which is quoted as the average charge. Their Lordships are apparently altogether oblivious of the fact that the average price here is obtained in circumstances which have no similarity to those of countries abroad. The average price is, of course, the product not of excessive charges in our industrial areas, but of amalgamating those charges with the high lighting charges in sparsely populated areas where industrial requirements are small. Equally absurd are the comparisons that were made regarding the average consumption per head of the population, which in our case does not include the production of all private plants and traction supplies. On this point, the Lords appear to be as easily deceived as the Commons. However, Viscount Falmouth truly remarked, in the course of the debate, that the low level of the average consumption of electricity per head of the population is due not only to the absence of water power in this country, but to the fact that we have a good supply of gas coal, and the gas industry here is the best in the world. It is overlooked that in water-power countries, where coal is scarce and dear, the absence of similar conditions in respect of gas supply tends to promote a greater consumption of the water-power generated current. In this country, the relatively low cost of gaseous heat energy makes it the preferable commodity for use in domestic cooking and heating and industrial purposes. In many industries, given gas of reasonable price in respect of thermal value, it is, in the interests of manufacture, advantageous to use it in preference to electricity.

In the Lords.

Their lordships made comparatively scant reference to the fact that it is, in the main, the attendant parts of the scheme, and not generation alone, which are objectionable to the electricity industry, and to those who have opposed the Bill. Apart from the overloading of the industry with transmission costs for the supply of unprofitable areas, there is all the cumbersome machinery which is to be set up for control and management, and for creating a complex condition of things in respect of production, sale, and resale of the energy. This machinery will introduce into the electricity industry another financial burden, the compensations for which are of such a vague order that their lordships showed considerable wisdom in applying to them the art of evasion. Lord Weir (who appeared in the House on this occasion to support the measure) manifestly does not place any great reliance on the savings to be effected by generation, but his dependence for success is upon the availability which the scheme of distribution will provide. However, the objective of the scheme is to secure small additional consumption from the less dense electrical areas; and what effect that is going to have on the ultimate average cost per head of population is difficult to see, though so much fuss regarding it has been made by the political supporters of the measure. Lord Banbury is very doubtful as to the prognosticated savings. He has in mind the statements of 1921, that the amalgamation of the railway companies would result in a saving of 20 to 40 millions sterling per annum. There has been no saving. On the contrary, in order to pay dividends, the railway companies have been obliged to help themselves freely from their reserves. A little insight as to how the Weir report was constructed was afforded by Lord Forres. His speech reflected the large part the Electricity Commissioners took in supplying the components of that document. His Lordship said that they were informed on the Weir Committee by the highest authority—the Government advisers (who are the Commissioners)—that no technical change in electricity provision has taken place since the Williamson Committee sat, which was about the time we were emerging from the war. In view of this, the Weir Committee dismissed to a large extent consideration of the technical side—that is to say, the *ipse dixit* assertions of the Commissioners satisfied them. But the Weir Committee did exert themselves to the extent of examining what added knowledge there was; but this, he confessed, also came largely from the Electricity Commissioners. On the question of the standardization of frequency, "some" outside evidence was taken. This light upon the excellent dousing given to the Weir Committee by the Electricity Commissioners is peculiarly interesting. An attempt was made by Lord Carson to have the Bill referred to a Select Committee. He feels it is a grave responsibility for the House to accept the Bill when such a large number of electrical experts assert that the scheme is going to do harm, while political supporters of the Government aver otherwise. Thus (while not objecting to some scheme of electrical co-ordination) he pleaded for investigation to justify the House in accepting a measure containing so much of an unprecedented nature. Support for Lord Carson's attitude was given by Lord Danesfort, Lord Montagu of Beaulieu, and others. Lord Montagu is one of those who have serious doubts regarding the prospects held out in the Bill, particularly when he remembers that generating costs only represent 20 to 25 p.ct. of the total cost, and yet the Bill outside generating costs will create additional charges, which will have to be borne by the consumer. However, the voting power of the Government gave a second reading to the Bill, and the Whole House will deal with it, instead of a Select Committee as suggested by Lord Carson.

Other Considerations.

Congratulations to "Electrical Industries" on the completion of twenty-five years' excellent service. Its birthday number came out with a pretty multi-coloured print dress, and embodied in it are several articles by men of eminence in the industry recording the progress made in the ramifications of electrical engineering. That veteran among electrical engineers, Col. R. E. Crompton, C.B., gives, from his own experiences, a summary of the advances of electricity supply from the period when lighting formed the principal demand to the present-day developments of power for industry and agriculture. The second prominent article is by Mr. E. Garcke on "Electricity in the First Quarter of the Twentieth Century." Mr. Garcke has for years been recognized as a highly-accomplished student of matters affecting the progress of the electricity industry, and a sound counsellor regarding its future. In the course of his article, he points out that the prophecies which have been made regarding electricity depend upon whether the Bill now before Parliament becomes law, and, if so, how it will be administered. The industry, he says, is now once again at the cross-roads; and it is remarkable that, whenever it is confronted by a serious crisis, it is not purely technical, not wholly industrial, not alone financial, but essentially political in its character. The opponents of the Bill, as he points out, are not opposed to super-power developments. They agree that standardization and systematical grouping, and interconnection of existing power systems and generation on large scale in efficient power stations, and transmission in bulk at high voltage to local distributors, will enable differential outputs to be adjusted with beneficial results, making for increased volume with greater efficiency and economy. They contend, however, that these results can be secured better without expensive bureaucratic administration; and the present owners of electricity supply undertakings are nervous lest the proposed legislation will again inflict grievous financial and confiscatory burdens upon them. They cannot feel much confidence that the experience of previous legislation will not be repeated. Later on, Mr. Garcke speaks of the proposed Central Board having power to interfere with the good work of others, while themselves free from responsibility for financial and administrative mistakes. In his view, it is probable that public opinion (say) 25 years hence will be that the 1926 Electricity Bill typifies the worst evil of collectivism—personal irresponsibility—and abandons the chief merit of individualism, initiative founded on accountability. Among other articles in the number is one by Mr. J. T. H. Legge, the Chief Engineer of the Shropshire, Worcestershire, and Staffordshire Electric Power Company. It is entitled: "Some Obstacles to Progress;" and in it there is a plea for greater facilities in respect of overhead transmission, and for wayleaves subject to a standard agreement by Government authority.

Mr. Garcke on the Position.

For years electrical contractors waged war against municipal trading in electric wiring and fittings—successfully for a time, until it was pointed out, and the Government believed it, that municipal bodies were placed at a disadvantage in respect of development through being deprived of wiring and selling authority. The contractors and

Municipal Trading and the Consumer.

the municipal corporations, however, came to terms, having, after years of warfare, arrived at the conclusion that their interests were identical. Interests being identical does not necessarily mean that there will be no collusion between the two parties to maintain prices at which work can be done, and appliances can be purchased, to the detriment of the consumers of electricity. That, however, would defeat the very object municipal corporations have in desiring to be possessed of wiring and selling powers, which are to bring about those conditions which will inure to a bigger business. But the consumers and ratepayers are beginning to wonder where they will be under the new order of things which is being brought about by the introduction of the agreed wiring and selling clause in the Government Bill. As is seen by a letter in "The Times," the London Municipal Society and National Union of Ratepayers are getting anxious regarding the position. The Secretary (Mr. W. G. Towler) calls attention to this:

> In the London County Council agenda of Oct. 26 last, the report of the Education Committee (paragraph 49) states that the tenders for wiring and fitting for electrical work at the L.C.C. Hackney Institute had been received. Ten tenders were submitted by private firms, and one tender by the Metropolitan Borough of Hackney (Electricity Department). The lowest tender was that of a private firm, amounting to £1899. The highest tender was that of the Metropolitan Borough of Hackney (Electricity Department), which amounted to £4137 15s. 5d.

The municipal tender was thus more than twice as much as the lowest one. Mr. Towler pictures the time when municipal undertakings will have acquired a monopoly of electric wiring and fittings, and wonders what will then happen. If municipal undertakings can and do specify the electrical fittings which shall be used by householders, he submits that consumers of electricity will soon be at the mercy of a municipal monopoly. Without any hesitation, he asserts that municipal electricity departments will use their full powers to extinguish private traders. We rather fancy that electrical contractors have sufficient strength to prevent municipalities—even if they have such a plan in mind (which we doubt)—bringing about conditions which will cause them to depart this life.

Drudgery and the Magician.

The electricity industry is receiving a great deal of assistance from electrical ladies through the delivery of lectures. We see that one has recently been given by Miss K. St. C. Lindsay, of Glasgow, on "Modern Lighting in the Home," into which she imparted a great deal of interest. Among other things, it is noticed that, by the aid of lantern slides, she demonstrated the harmful effect of glare on the eyes, and emphasized the necessity of people putting an end to the use of bare electric lamps. At Birmingham, too, in connection with the local branch of the Electrical Association for Women, Miss Griff (Chairman of the Women's Engineering Society) recently gave a lecture entitled "Electricity—the Domestic Magician." A demonstration was given of electric cooking and the use of an electric sewing machine. On the occasion, Lady Brooks presided, and remarked that electricity was going to show that the drudgery of domestic life could be done away with; and if women would use labour-saving electric appliances, they would be free to enter into a more intelligent and interesting life. A curious thing about all these lectures by ladies associated with the electricity industry is that they talk of the domestic electrical "magician" and the "drudgery" of domestic life as though nothing had ever been done to ameliorate the lot of housewives. Long before these ladies ever thought anything about the subject on which they expatiate so eloquently (if not with consistent accuracy), the gas industry had done much to remove the drudgery of household work, with such success and economy, combined with reliability, that to-day there are in use many millions of gas cookers, gas fires, water-circulators, geysers, wash-boilers, &c., and additions are being made at an increasing rate. In domestic life, gas has been the real "magician," and has gone far to remove the drudgery of which, late in the day, so much is made by the imitators of the gas industry.

EVENING STAR LODGE, No. 1719.

The W.M., W. Bro. Alfred H.. Henry, presided over the regular meeting of the Evening Star Lodge, No. 1719, at Freemasons' Hall, Great Queen Street, London, last Wednesday. He was assisted by Bro. Frederick G. Cockey as S.W., and W. Bro. Arthur L. Croager as J.W. There was a good attendance of members and visiting brethren.

Following the transaction of the usual preliminary items of business, Bro. Arthur Maurice Bell, of the Tottenham Light, Heat, and Power Company, was advanced by the W.M. to the degree of M.M.; W. Bro. James W. Foreman officiating as S.D.

Subsequently Mr. James Howard Goldsmith, of the Engineers' Department of the Lower Sydenham Works of the South Suburban Gas Company, and Mr. Lionel Richard Fender, Engineer and Manager to the Henley-on-Thames Gas Company, were initiated by the W.M.; Bro. John A. Brentnall carrying out the duties of J.D.

The S.W., Bro. Cockey, was elected W.M. of the Lodge for the year 1927-28; and W. Bro. Arthur E. Croager, P.M., P.P.G.D. Kent, was re-elected Treasurer, to hold office for that period. It was resolved that a P.M. jewel be presented to the retiring master, W. Bro. Henry, as a mark of the brethren's respect and esteem; and that a donation be granted to the Royal Masonic Institution for Girls at the ensuing festival, at which he would be representing the Lodge as its Steward.

Two candidates for initiation were proposed—viz., Mr. Harold Temple Abady, Director of Messrs. Alexander Wright & Co., Ltd., and Mr. David Edward Terrace, Constructing Engineer, of Messrs. Humphreys & Glasgow, Ltd.

The Lodge was then closed; and the members and their guests took dinner together in the Connaught Rooms.

The Loyal Toast, and those relating to the grand officers, to the W.M., and the I.P.M. were honoured. The health of W. Bro. Freeman Burrows was pledged, with reference to the distinction of P.J.G.W. of West Lancashire, which had recently been conferred upon him. Bro. John Terrace proposed "The Initiates," to which Bros. Goldsmith and Fender replied. The toast of "The Visiting Brethren," submitted by W. Bro. Arthur E. Broadberry, P.M., L.R., was acknowledged by Bro. Erricson, of Stockholm; W. Bro. Vernon, W.M. of the Lily of Richmond Lodge; W. Bro. R. H. Sayers, P.P.A.G.D.C., West Lancashire, of the Northern Star Lodge; and Bro. R. J. Meiklejohn, of the Murdoch Lodge. W. Bro. H. W. Packham, P.M.; Bro. John A. Brentnall; and W. Bro. Reg. W. Foster, L.R., responded to the toast of "The Past Masters and Officers of the Lodge," which was given from the chair.

The toasts were interspersed with well-rendered musical selections.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Dec. 2.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Formal meeting for election of officers.—Grand Hotel, Birmingham, at 3.30.

Dec. 4.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Joint visit with Western Junior Gas Association to the Beckton Works of the Gas Light and Coke Company.

Dec. 4.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Joint meeting with Eastern District, at Edinburgh. Paper by Mr. C. B. Tully.

Dec. 7-8.—INSTITUTION OF FUEL TECHNOLOGY.—Meeting.

Dec. 8.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Stretford Gas-Works. Paper by Mr. J. Carr.

Dec. 8.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of Messrs. Parkinson & Cowan, Ltd.

Dec. 9.—MURDOCH LODGE No. 3480.—Meeting at 4.15.

Dec. 14.—NATIONAL GAS COUNCIL.—Meeting.

Dec. 14.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Dec. 16.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting at Birmingham. Paper by Mr. A. Knight.

Dec. 17.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. C. M. Croft.

Feb. 16.—"B.C.G.A." MIDLAND DISTRICT CONFERENCE.

INSTITUTION OF GAS ENGINEERS.

Dec. 13.—Emergency Committee, Finance Committee.

Dec. 14.—Advisory Committee on Education.

Fuel for Metal Melting.—At a joint meeting of the Staffordshire Iron and Steel Institute, the Birmingham Metallurgical Society, and the local section of the Institute of Metals, in Birmingham, a discussion took place on "Metal Melting." Dr. C. M. Walter (Research Laboratories, Birmingham Gas Department) said that, in view of the coal dispute, various kinds of fuel were adopted; and he suggested that the experience of manufacturers should be obtained. In the past, fuel had, in many instances, been wastefully employed; and perhaps some of the older types of melting furnace were responsible, owing to the low efficiency obtained by their use. In recent years they had been watching developments in connection with furnaces of the regenerative type—especially where metal had to be melted in bulk, and the reverberator hearth was used. That type of furnace was being adopted with great success for the melting of non-ferrous metals. He hoped that in the near future the smaller brass foundries would employ furnaces of modern type.

MANCHESTER TAR CONFERENCE.

[Abstracts of five of the Papers presented are given on following pages.]

The Tar Conference arranged by the Society of Chemical Industry, the Institution of Gas Engineers, the Coke Oven Managers' Association, the Institution of Mining Engineers, and the Manchester Geological and Mining Society, was held in the College of Technology, Sackville Street, Manchester, on Friday, Nov. 26. The programme of three sessions was carried out according to plan; and the attendances throughout were very large.

A WELCOME.

The LORD MAYOR OF MANCHESTER (Alderman J. H. Swales) opened the proceedings by extending a hearty welcome to those attending the conference. In enumerating the various Societies concerned with the conference, he said that not so very long ago they were all practically fighting one another; but now they had put their heads together, and were working for the common good. Last year there had been a conference on solid smokeless fuel suitable for domestic purposes; and this in itself was a very important matter. The problem of a home supply of fuel oil was another important problem; and now they had come to the study of coal tar. There were many more things that could be got out of coal in the course of gas manufacture than were obtained to-day; and he hoped that the conference would be as successful as the previous conferences at Sheffield and Leeds.

Mr. F. H. CARR (the President of the Society of Chemical Industry), proposing a hearty vote of thanks to the Lord Mayor, said the Societies represented attached the greatest importance to coal, and to the value of conferences of this character. If they looked back fifty years, and noticed the progress that had been made in the utilization of what was, after all, the foundation of the riches of this country, they must marvel at the change that had taken place; and those who were able to look back in another fifty years' time would be equally impressed at the changes between now and then. It was through the work of conferences such as this that progress would be made. Manchester was a most suitable place for such a conference, because, whenever industrial progress in this country was discussed, the name of Manchester was always in the forefront.

Prof. A. SMITHELLS, seconding the vote, said that he himself was hardly a visitor to Manchester, because it was really a home-coming for him. He stood within a few miles of the place where he was born; and it was in Manchester that he received his chemical education from that beloved master whose name would always be honoured in the city—Sir Henry Roscoe. He felt certain the conference would be successful, because Manchester was a centre in which so much had been done in connection with the subject to be discussed.

The vote of thanks was carried with acclamation.

SUGGESTED LABORATORY.

Mr. L. GUY RADCLIFFE (as Chairman of the Manchester Section of the Society of Chemical Industry) said he was proud to have this conference in Manchester, and to be one of the partners therein. Personally he was not a competent judge of the subject to be discussed; but, as an outsider, he wondered what had become of a suggestion made a few years ago that the Institution of Gas Engineers might, by a fusion of the interests of District Institutions of Gas Engineers, establish a central laboratory for research and advice on problems of immediate and paramount interest to gas engineers. With a carefully selected and trained staff of chemists in touch with the engineers, such a laboratory would be available for solving vital problems jointly. The Lancashire and Cheshire Coal Research Association had created and financed a laboratory which was actually housed in the Manchester College, and had done, and was continuing to do, most valuable work. Generous financial support would be needed; but the co-operation of many works would provide the funds, and every gas undertaking helping to finance the scheme would reap the advantage. It might well be that the laboratory would be situated in Manchester, and its sphere of influence be Lancashire as a whole; but it would quickly become of national importance. This idea was not wholly his; but it had deeply impressed him, as research was a sheer necessity for every industry. Therefore, he ventured to revive the idea, and bring it before the conference, because he felt it was worthy of the serious consideration of the gas industry.

MORNING SESSION.

Prof. A. SMITHELLS, F.R.S., then took the chair, and presided over the morning session, at which the following papers were read, and discussed together:

"A Study of Tars and Oils Obtained from Coal," by Mr. F. S. Sinnatt, Dr. J. G. King, and W. H. Linnell.
"A Plea for Standardization of Analytical Methods in Coal Tar Products Specifications," by Mr. W. Gordon Adam.
"The Viscosity of Tar," by Mr. H. M. Spiers.
"The Consistency of Bitumen Mixtures," by Mr. H. M. Spiers.

[Notice of the papers presented at this session, and the report of the discussion, are held over until the next number of the "JOURNAL."]

AFTERNOON SESSION.

Alderman THOMAS GLOVER (Norwich) presided at the second session, and in the course of his opening remarks said he was afraid the gas maker in the past had treated tar in a rather haphazard way. Tar came, whether he liked it or not, and whether he wanted it or not; and it came of some quality or other. The result was that the gas maker had left it to the tar refiners to find out how to get the greatest value out of the tar which was produced. The gas maker, however, was now taking a more intelligent interest in this subject than he used to; and he (the speaker) could remember quite an evolution in the production of tars. He recalled the days before the introduction of high-temperature carbonization as known to-day—before the introduction of the regenerative furnace. The tar then had a gravity of something like 1·1. When the regenerative furnace was introduced, with consequent high temperatures in the settings, and the gravity of the tar became 1·2, the naphthalene content went up, the free carbon content reached 30 p.ct., and it was difficult to distil the tar because of its water content. This form of carbonization also had effects on the other products and on the gas, particularly as the naphthalene not only went into the tar, but remained in the gas, and gave everlasting trouble in distribution. Under these conditions, also, the organic sulphur went up in the gas to a considerable extent. He remembered the next stage when horizontal retorts were filled, and the gravity of the tar went down, its naphthalene content went up, the production in volume of tar went up, the sulphur content in the gas went down, the naphthalene in the gas went down, and there was a fluid tar of greater value than the high-temperature tars of the previous period. Then came the vertical retort, and other conditions were introduced. New values were being found in vertical retort tar, which must always be a mixture of low-temperature and high-temperature oils and other products. The conference was a timely one, and showed a determination on the part of all concerned to tackle their problems in the most scientific manner possible.

STANDARDIZING METHODS OF TESTING.

Dr. E. W. SMITH (Hon. Secretary) said that, arising out of suggestions made during the morning as to standardizing methods of testing, the following resolution had been drafted:

> That a Joint Committee consisting of the Fuel Section of the Society of Chemical Industry, the Coke Oven Managers' Association, and th—e— Institution of Gas Engineers be requested to devise means for the formation of a representative Committee which shall standardize as far as possible the methods of testing tar and its constituents.

The resolution was carried unanimously.

The following papers were then read:

"Distilled Tar for Road Purposes," by Mr. W. Gordon Adam.
"Vertical Retort Tar for Road Purposes," by Mr. Michael Barash.
"Influence of Carbonizing Conditions upon the Free Carbon Content of Tar," by Mr. H. Hollings.
"Tars from Steamed Vertical Retorts," by Dr. A. Parker.

[These papers follow in the above order, and the discussion upon them is reported on p. 561.]

EVENING SESSION.

Mr. E. ESCOTT WOOD (President of the Coke Oven Managers' Association) presided at the evening session, when the following papers were read:

"Notes on Vertical Retort Tar," by Messrs. J. Macleod, C. Chapman, and T. A. Wilson.
"Coal Tar Disinfectants," by Mr. A. C. Tait.
"The Evaluation of Pitch," by Mr. H. F. Taylor.

[The first of these papers follows that by Dr. Parker, and the discussion is given on p. 562.]

At the conclusion of the conference, cordial votes of thanks were passed to the three Chairmen, to the authorities of the School of Technology, to Messrs. Radcliffe and McCulloch for the work they had done in Manchester in connection with the conference, and to Messrs. Smith and Talbot, the Joint Hon. Secretaries of the Fuel Section of the Society of Chemical Industry.

Treating Zinc Ore with Gas.—A rich body of zinc ore which was recently developed in an Oklahoma mine was found to possess a high content of asphalt oil that made it difficult and expensive to smelt. Oil-fired kilns did not, according to the "American Gas Journal," free the ore of its gummy deposit, and so it was decided to experiment with gas. A main was laid by the local gas undertaking, and two kilns were equipped with gas burners. It was found that treatment in these gas-fired kilns not only left the ore entirely free of asphalt oil, but enabled a material increase to be made in the tonnage passing through the kilns.

DISTILLED TAR FOR ROADS.

By W. GORDON ADAM, B.A., M.I.Chem.E., Superintendent of the Bye-Product Works, Beckton, in consultation with H. W. ROBINSON, of the Midland Tar Distillers, Ltd., representing the British Road Tar Association.

The employment of distilled or refined coal tar for road making continues to increase, in spite of criticisms, which are of two kinds—one interested, destructive, and to an extent unscrupulous; the other disinterested, constructive, and to an extent founded on facts. This is not the place to discuss the former, but rather to show how the constructive criticism may be satisfied, and how the faults of the past may be amended in the future. It has been a fault of the past that, given certain conditions of weather an improperly refined tar, and under careless conditions of laying and extremely unusual conditions of weather even a fairly good refined tar, may have been injurious to fish, owing to surface drainage ultimately reaching streams. It has been another fault that, whether from lack of knowledge, from the desire for cheapness, or from the want of any worthy standard specification, tar of an inferior quality, or, it may be, tar of good quality but of a wrong viscosity for the particular purpose, has been used, with a resulting road that has not stood-up to traffic in the expected manner.

In the early days, only one descriptive word was sufficiently universal to cover all the qualities of road tar that were in use—namely, the word "black." The same word is applicable to all the qualities to-day; but now the specification which is likely to be generally accepted as necessitating a good quality is a little more complicated, and the following, which is based upon experience, may be relied upon to give a first-class article, well worth its extra cost. Admittedly, it may be difficult to bring within the limits of this specification the product of every variety of the raw material. This specification, designed to cover only such products as will give satisfactory results in practice when applied under correct conditions, is as follows:

SPECIFICATION.

1.—*Source of tar.*—The tar shall be derived wholly from the carbonization of coal, except that it may contain not more than 10 p.ct. of its volume of tar (or distillates or pitch therefrom) produced in the manufacture of carburetted water gas.

2.—*Specific gravity.*—The specific gravity of the tar at 15·5° C. (60° Fahr.) shall be not lower than 1·150.

3.—*Consistency.*—The consistency of the tar shall be measured by the Hutchinson tar tester, using No. 2 Poise, at 25° C. (77° Fahr.), and shall be in accordance with the specification of the buyer; reasonable margins being given. The following suggestions are made as to the most suitable consistencies for different purposes: Spraying: Summer, 8—15 sec.; winter, 5—10 sec. Tarred slag: Summer, 18—25 sec.; winter, 10—20 sec. Tarred limestone: Summer, 25—35 sec.; winter, 15—30 sec. Tarred granite or basalt: Minimum, 30 sec. (no maximum). Grouting: Summer, 90—120 sec.; winter, 80—100 sec.

4.—*Distillation.*—1000 grammes on distillation in a standard apparatus shall yield the proportions by weight of distillates as stated below. The temperature shall be read on an accurate nitrogen-filled thermometer. Fraction A to 270° C. (518° Fahr.), not less than 120 grammes for tars of which the consistency is below 30 sec., and not less than 100 grammes for tar of which the consistency is 30 sec. or above. Fraction "B" between 270° and 300° C. (518° and 572° Fahr.), not less than 50 grammes for tars of which the consistency is below 30 sec., and not less than 35 grammes for tars of which the consistency is 30 sec. or above. The distillation to be conducted in a standard 1 litre distillation flask with side tube.

4A.—The tar shall be commercially free from water—*i.e.*, it shall not contain more than 0·5 p.ct. by volume. The amount of water is to be determined while carrying out the above distillation; that portion of the distillate containing it being collected separately in a small graduated cylinder. The quantity of water is then measured and separated from any oils that distil with it; the latter being added to the rest of Fraction A. The tar, when heated in an open cylindrical vessel to 200° Fahr. at the rate of 5° Fahr. per minute, shall not increase by more than 10 p.ct. in apparent depth.

4B.—*Ammonia.*—The water separated as above shall not contain more ammonia than corresponds to 1 grain in 15,000 grains of the tar (equal to 70 mg. per litre), the ammonia to be determined by direct titration with standard acid.

4C.—*Tar Acids.*—Fraction A shall not yield to repeated extractions with caustic soda solution of sp. gr. 1·10, more crude tar acids than is equivalent to 2 p.ct. by volume of the tar, which tar acids, when submitted to the special test for phenol, shall not give a coloration which corresponds to the presence of more than 10 p.ct. of phenol by volume on the tar acids. The phenol shall therefore be below 0·2 p.ct. on the original tar. The phenol in the crude tar acids is determined by the method of R. M. Chapin ("J. Ind. Eng. Chem.," 1920, 12, 771).

4D.—*Naphthalene.*—This shall be determined by cooling Fraction A, or a portion thereof, to 15·5° C. after removal of the tar acids, and maintaining it at that temperature for half an hour. The naphthalene is then filtered off with the aid of a filter pump, pressed between folds of blotting paper until free from oil, and weighed. The weighed naphthalene should not exceed 5 p.ct. of the tar.

5.—*Free carbon.*—The tar shall contain not less than 12 p.ct., and not more than 22 p.ct. by weight, of free carbon.

In the author's opinion this specification should be embodied by every surveyor in every tender form calling for a refined tar for any but the most temporary and cheap repair work.

The specific gravity and free carbon figures supported by the distillation figures are of value as indicating the suitable nature of the original tar, and indicate the presence of hydrocarbons of good binding properties. Light oil and water are detrimental in many ways; and their exclusion incidentally prevents frothing and loss in the tar heater. The naphthalene content of a road tar should be low; an excess rendering the tar granular when cold. The loss of excess naphthalene from the tar after application gives a rapid change of consistency, and reduces the waterproofing efficiency of the surface; while a high naphthalene content under certain conditions may be a contributory factor to the toxic nature of the road washings.

A great deal of work has been done on the toxic nature of road tar washings; and our knowledge of this matter has been much extended since the days of the imperfect Alresford experiments. The term "imperfect" is used advisedly, since in these experiments no attempt was made to use the best possible, or even an average good, product, but a material was laid down which just conformed (except for the naphthalene content, which fell widely outside the limit) to the Road Board Specification. The tar was put down under such conditions that the report states that the road commenced to break up four months after spraying, a sufficient indication that the work was imperfect, to say the least of it.

ROAD TAR AND FISH LIFE.

The toxicity of road tar washings has been the subject of extended investigations during the past year at Beckton and elsewhere. At present, the Beckton conclusions are based on results obtained with carp; but it is hoped to extend the work to trout during the coming year. It has been found there that the toxicity of a given tar decreases with increasing viscosity, and that soft pitches in general are non-toxic under standard experimental conditions. The toxic effects of tars become far less evident as the proportion of constituents of lower boiling point is reduced. The use of oils or very fluid tars may lead to a coating of oil or tar on the water's surface, and hence a heavy destruction of insect life. It has been confirmed that both the acidic and basic constituents of the tar are toxic to fish in varying degrees. The rapid recovery of the fish when placed in clean water is worthy of note.

Experiments upon trout at the instance of others confirm these results so far; but the author is informed that an entirely novel method of treating tar has been devised which gives exceedingly hopeful results. A repetition of the Alresford experiments is practically certain, so that it is probable that even on the 4 or 5 p.ct. of English roads which drain directly into fishing streams, tar may in future be as welcome as it is elsewhere. This new method aims at destroying the poisonous constituent of the tar by chemical treatment.

It is of interest to know that the proprietor of one of the largest trout farms in the country has had the whole of the roads and paths around his rearing and stock ponds constructed with materials waterproofed with a well-known branded tar compound. These roads and paths drain directly into the ponds. In general, it may be said that the real damage caused by drainage from tarred roads has been much exaggerated; and trade effluents are now being recognized to be far more important factors. Many well-known fish rivers, such as the Welsh Dee, flow between miles of tarred roads; and particularly since standardized proprietary brands have been mainly used, no trouble appears to have been experienced.

The Clean River Society has found that pollution has had far less effect in 1926 than in previous years; and this is to be attributed to the reduction in works operations due to the coal strike, the amount of road tarring that has been carried out in all parts of the country being well up to the average of past years.

APPLICATION.

Having made available a range of tars suitable for each purpose, it remains to consider the methods of application advised in order to achieve the best results. Considering, first, the tar spraying or painting of roads, for which a standard tar is the material *par excellence*, it is admittedly preferable that the tar at a temperature of 220° to 240° Fahr. be applied to a dry, well-brushed road; while hand or mechanical brushing after spraying ensures good adhesion and penetration. The final

gritting of the road should not be scamped; and the application of a sufficiency of granite chips, followed by a final rolling, is recommended. Tar, like bitumen, but not nearly to the same extent, suffers from the disadvantage that it should not be applied, if the best results are wished for, to damp or wet roads; and an attempt has been made to overcome this difficulty by the use of bitumen, tar-bitumen, and tar emulsions. Satisfactory tar emulsions have been prepared, and, with the bitumen emulsions, fulfil, in my opinion, a limited function only. It is true that they can be applied to a wet road, and that a minimum of labour is involved in the application; but on the debit side there are the cost of the emulsifying agent and the emulsifying process, and the cartage of 40 to 50 p.ct. of water.

After repeated trials and reports from different parts of the country, I am of the opinion that—though emulsions fulfil a definite purpose, in that they can be applied to a road under diverse weather conditions, and therefore can be applied to a road (say) in early winter, and waterproof it sufficiently to carry it through to the following spring, provided that no severe frost follows soon upon the work, or can be used for general patching-up of roads just starting to break up in small areas—the general result is not so lasting or so satisfactory as a normal treatment with tar.

It is not needful to devote much time here to the mixing of aggregate with tar, because this work is done, as a rule, by private enterprise in plants situated at the place where the aggregates occur, and the various makers are, in the main, expert at their job.

They realize that tar of a certain viscosity is most efficient for the particular material which they are treating. Under the specification heading "Consistency" are given the most suitable viscosities as determined by general good practice. All these can be supplied by any efficient tar distiller in a product falling within the other limits of the specification; and surveyors should insist that the tar used by their contractors for tarred aggregates shall comply with that specification.

The process of grouting, which consists in applying tar to a dry road in the course of the construction of the road, using, in fact, tar in place of water, while the road is being made, is one which in certain hands has given extraordinarily good results. These depend largely upon the training and aptitude of the man actually in charge of the work. One essential, however, is that tar of the heaviest workable viscosity should be used. The expert road maker must see that its application is even and regular, so that each square yard may have its proper share. One further word about viscosity. It is generally agreed that the limits of viscosity upwards should be raised when practicable, and that the most expert practitioner is he who can use tar of the highest viscosity for his immediate purpose.

Road making, as distinct from surface treatment, entails also the consideration of many factors, in addition to the quality of the binder used—for example, foundations and drainage, and the nature and grading of the aggregate. The reputation of bitumen as a binder has been materially assisted by the fact that the construction of bitumen roads has generally been in the hands of county surveyors, or big contractors, who have given full consideration to drainage, and to stability of the foundation. Tar macadam, being easy of application, is frequently employed by those of less experience, and applied in the simplest possible manner, without consideration of the ability of the foundation to stand up to its job; and with a false sense of economy, the depth of the macadam layer is reduced beyond a reliably safe figure.

Macadam used a 10-in. layer of broken stone, consisting of approximate cubes, and consolidated the layer under pressure to reduce interstices with a view to reducing grinding of the material after the road was laid. Subsequently, the use of ¾-in. to pinshead rock chips or siliceous gravel was found necessary. To-day, on a proper foundation, a tarred macadam layer of not less than 3½ in. thick may be considered satisfactory. It is frequently observed that in modern practice a tarred aggregate consisting of irregular-shaped pieces of 1½ to 2½ in. dimensions is employed; and except for the tar, no attempt is made to reduce the voids necessarily formed in the use of such material, and the tar film is insufficient to provide a solid resilient road. An attempt has been made in the laboratory to obtain figures bearing on this point. A number of sections of consolidated clinker-soft-pitch mixtures containing differently graded aggregate were prepared, and the tensile strengths determined. The connection between the calculated percentage of voids in the aggregate and the tensile strength was shown as follows:

—	Voids in Aggregate. P.Ct.	Tensile Strength. Lbs. per Sq. In. at 60° Fahr.
Experiment No. 1	70	50
,, No. 2	53	149
,, No. 3	30	356

No. 3, if further compressed and well rolled, gives a tensile strength figure of 600 lbs. per sq.in. This material might be termed pitch concrete; and it will be noted that the aggregate containing 30 p.ct. of voids produces a mixture giving immediately on cooling a similar tensile strength to that obtained for 3:1 sand cement after 28 days' setting.

These laboratory results, which were based on theoretical considerations only, are being independently investigated in two series of experiments, the first of which is being carried out jointly with the British Road Tar Association in co-operation with Mr. J. Sutcliffe, Borough Engineer and Surveyor of Woolwich; and the second series, with Mr. Ernest J. Elford, Borough Engineer and Surveyor of Wandsworth. In the first of these experiments a destructor clinker, partially broken, screened, and graded, has been mixed with soft coal tar pitch at a temperature of 340° Fahr., and the material rolled down so as to form a carpet 2 in. thick. This promises to give at least as good results as have been obtained with the same clinker bound with bitumen; considerable stretches of road having been laid with this material in the Borough of Woolwich. Arrangements have been made to lay a stretch of road with aggregate bound with coal tar pitch.

In the second experiment, a base course of 2½ in. slag, the interstices of which were filled with ¼-in. slag chippings, was laid on the foundation, and a surface course or "carpet," consisting of 1¼ in. down to 200 mesh, was mixed with a soft coal tar pitch at 270° Fahr., and compacted by rolling to a thickness of 6 in. in the foundation, and 2 in. in the "carpet." It is too early yet to express an opinion as regards the life of these trial stretches; but present appearances promise well.

A Central Marketing Agency.

The use of road tar has been, to a certain extent, handicapped by sales and delivery methods; and it will be generally conceded that an increased range of vision would do much to stabilize the use of road tar by surveyors. The surveyor, from his own point of view, is on good ground when he complains seriously about the heavy fluctuations in the price of road tar from year to year, and even from month to month. This is a matter which creates particular difficulty for surveyors whose estimates have to go before county and municipal councils; and some form of central marketing agency, which would standardize and stabilize prices independently of the fluctuations in pitch or other markets, is suggested as desirable. Such central selling agency would also be well adapted to deal with the questions of quality and of increased delivery service; and methods of delivery which avoid repeated handling of the material must come into use.

Much might be done to help the surveyor, and cheapen the cost of road work, by assisting him to eliminate barrels—the relatively expensive form of package at present so much used. Recently an advance has taken place to the extent that tar is more frequently delivered in bulk by rail and road tanks for transfer to the small road boilers, or to depôt storage tanks; but next year a further advance will be made in that there will be seen on the roads tanks delivering hot tar direct from the distillery to the road—the tank being equipped with spraying and brushing gear. This method will make available for application under straightforward simple conditions every grade of tar, from the relatively fluid spraying material, to a soft pitch of fixed penetration test for grouting work.

The future outlook for the use of tar on roads is brighter than it ever was. Even cement concrete roads are being surfaced with tar macadam, and tar is being used to cover up the skiddiness of other surface binders. Pitch concrete roads are in their infancy; but even with these bright prospects before him, the tar distiller must not forget that the surveyor no longer buys tar because it is black, and that along with quality efficient service must be given. It is up to the surveyor to see that he obtains the right material for the work in hand.

Mr. ADAM, in the course of some additional remarks, said that, from the Ministry of Transport figures, it appeared that the percentage of bitumen on the London-Edinburgh, the London-Carlisle-Glasgow, and the London-Portsmouth roads was only 5. This was a surprisingly low figure.

The specification set out in the paper had been discussed during the last few weeks by the tar producers; and a similar specification was being accepted by them. Even some of the smaller tar producers, who had been unable to comply with the existing specification, and had opposed it, were now falling into line, and were beginning to see that it would really pay them to turn out a good article. They were recognizing that in the past small quantities of bad tar had done a great deal of damage to the reputation of tar as a road material.

With reference to naphthalene and tar acids, it was felt that with certain tars—such as vertical tars and blast furnace tars—it was difficult to reduce their tar acid and naphthalene contents. Moreover, their specific gravity was lower than that given in the specification. The best way to overcome this was to allow a certain latitude for particular tars, and surveyors using them would understand that they did not conform to the new specification, in certain particulars.

During the past year, something like 90 million gallons of tar had been used on the roads in this country.

VERTICAL-RETORT TAR FOR ROAD PURPOSES.

By M. BARASH, Research Department, West's Gas Improvement Company, Ltd.

[Extract.]

In this paper, when referring to "vertical-retort tar," it is intended to indicate only the tars produced in continuously operated vertical retorts working under modern high-temperature conditions with a moderate amount of steaming, incidental to the manufacture of gas varying between the limits of (say) 450 to 525 B.Th.U. per c.ft. In the term "bitumen" is included the naturally-occurring bitumens, as well as the closely-related artificially-prepared petroleum residues.

The tar distiller, as well as the user of tar for road purposes, has to realize that most probably within a fairly short time vertical-retort tar will form by far the greater proportion of the available tar. In many localities, even at present, it is already the only type of tar being produced by the large and small gas-works in the vicinity, and there is certainly no difficulty in the disposal of it either for local requirements or for transport by rail or by water.

FROM THE POINT OF VIEW OF THE TAR PRODUCER.

That there is a ready demand for vertical-retort tar and that it is more valuable than horizontal-retort tar can readily be proved from authentic figures. Moreover, the yield of tar per ton of coal carbonized in vertical retorts is always considerably higher than the yield per ton from the same coal in horizontals. The tar yield in horizontals may be taken as from 9 to 12 gals. per ton; in the case of vertical-retort carbonization the yields generally vary between 14 and 25 gals. per ton, while in exceptional cases, where excessive steaming of the charge has been practised, yields of 30 gals. per ton have been realized.

It is interesting, particularly from the point of view of the gas undertaking combining the production and refining of tar, to show the following comparisons of the values of vertical-retort and of horizontal-retort tar produced from similar coals in the same district. The figures are all deduced from actual results obtained by a large undertaking and from the assessments in vogue in the district concerned during the early part of this year.

Returns from Vertical and Horizontal Tars.

Yields per Ton of Tar.

—	Vertical Retorts.	Horizontal Retorts.
Crude naphtha	5 gals.	2¼ gals.
Creosote	96½ gals.	55 gals.
Pitch	9 cwt.	13 cwt.
Total tar make per ton coal	14 gals.	10 gals.

Yield per 100 Tons of Coal Carbonized.

Total tar	1400 gals. at sp. gr. 1·09 = 6·81 tons	1000 gals. at sp. gr. 1·20 = 5·36 tons
Crude naphtha	34 gals.	12 gals.
Creosote	657 gals.	295 gals.
Pitch	61·3 cwt.	69 7 cwt.
Value of tar*	£31 10s. 9d.	£22 9s. 0d.

* Naphtha at 10½d. per gal., creosote 6½d. per gal., pitch 80s. per ton.

These figures were prepared in connection with the claim by a buyer of tar products from the gas undertaking for a reduction of 1d. per gallon on the price of vertical-retort tar creosote because of its lower specific gravity, and a reduction of 10s. per ton on the price of the pitch because of its alleged inferior binding properties. Even if these drastic reductions were allowed in the above figures, there would still be left a credit in favour of verticals of £4 16s. 4d. per 100 tons of coal.

It has been ascertained on recent inquiry that the proportion of vertical-retort tars converted into road tars varies considerably in different localities, but, on the whole, probably reaches 60 p.ct. of the total output, the remainder being distilled to pitch for the sake of the valuable yields of oils. Straight distillation up to definite points in the majority of cases results in the production of residue tars which conform to the requirements of the Ministry of Transport (Road Department) Specifications 3 (*a*) and 3 (*b*) for Road Tars No. 1 and No. 2.

Gas undertakings have no difficulty with regard to the disposal of vertical-retort tar.

FROM THE POINT OF VIEW OF THE TAR REFINER.

The main differences which characterize vertical-retort tars and distinguish them from horizontal-retort tars may be summarized as follows: (*a*) They yield considerably larger proportions of oils (both "light" and "heavy"). (*b*) The fractions almost invariably contain a comparatively high percentage of paraffins; and hence are always lighter (lower sp. gr.) than corresponding horizontal-retort tar fractions. (*c*) They have lower naphthalene and "free carbon" contents. (*d*) They usually have considerably higher phenol or tar acid contents.

Simple distillation suffices for the preparation from crude tars of road tars complying in every respect with the specifications. This applies to tars derived from either vertical or horizontal retorts. In some cases, however, simple distillation does not yield a residue tar complying with the specifications. It happens that one or other of the constituents is present in the crude tar in excessive proportion, and distillation of the tar down to the point at which this constituent is reduced below the specified maximum generally leads to the production of a residue in which the consistency, specific gravity, and/or "free carbon" content are higher than the maxima allowed even for a No. 2 road tar.

Thus, some horizontal tars require excessive "topping" in order to reduce the naphthalene content of the residue to an acceptable value. On the other hand, some vertical-retort tars require so much topping to reduce the tar acid content to the limit allowed for a No. 1 road tar that the consistency of the residue is brought into the range of the No. 2 road tars. A remedy in such cases is the addition, to the residue tars, of suitable amounts of oils poor in the substance present in excess therein—*i.e.*, naphthalene-free oils to bring the consistency of the super-thick horizontal tar residues below the limiting value of 100 seconds, and decarbolated oils to bring the consistency of the vertical tar residues back from the No. 2 to the No. 1 range.

In some cases the complaint has been made that vertical-retort tars cannot be converted into road tars of high enough viscosity; but the remedy is obvious—the addition of a suitable amount of a more highly "topped" residue or pitch.

FREE CARBON.

It is difficult to conceive how the presence of inert matter can materially improve the binding properties and resistance to disintegration of a road tar; in fact, the reverse would be naturally expected. It is surprising, however, how much controversy exists on this point.

Looking at the question from the purely scientific point of view, it would certainly appear that the vertical-retort tar should be considerably superior to horizontal-retort tar because of the low "free carbon" content of the former. This is actually claimed by several authorities on the subject; the contention being that road tars containing a minimum of free carbon must be more elastic than those containing more. This contention is supported by the fact that bitumen, which is virtually "free carbon" free, is admittedly less liable to cracking than most road tars.

Under the modern conditions of heavy charges in horizontal retorts heated for lengthy periods at high temperatures in order to give as high gas yields as possible, horizontal-retort tars are excessively "cracked," and this gives rise to high proportions of uncombined carbon. Though in some cases this inert material is stated to give "body" and extra tenacity to the road tar or pitch, there is little doubt that when spread in thin films over road material, &c., the particles of carbon tend to segregate, absorb moisture, and give rise to serious disintegration. This is comparable with the objections to naphthalene, which, in road tars, is known to have a tendency to separate out from the magma, and so cause irregularities and points of weakness fatal to the strength and continuity of elastic films. One must therefore conclude that a high "free carbon" content does not necessarily give increased elasticity or binding power.

NAPHTHALENE.

A strong point in favour of the production of road tars from vertical-retort tar is its comparatively low naphthalene content. Road tars tested according to the standard tests advocated in the specifications often show no naphthalene at all when prepared from vertical-retort tar, while the frequent difficulty of reducing the naphthalene content of horizontal-retort tar residues is well known.

SPECIFIC GRAVITY.

The specific gravity of vertical-retort tar is decidedly lower than that of horizontal-retort tar; also the specific gravity of any fraction of the distillate as well as of the residue is lower than that of the corresponding fraction from horizontal tar. The lower specific gravity of vertical-retort road tar is distinctly in its favour, as we are dealing with a material which is almost invariably bought by the ton, and which is used in such a way that its covering power, and therefore its volume, is utilized rather than its mass. In other words, the amounts of aggregate which can be bound together by a ton of vertical-retort tar and a ton of horizontal-retort tar are in the inverse ratio of the specific gravities of the tars—approximately in the ratio 1·20 to 1·15.

FROM THE POINT OF VIEW OF THE ROAD AUTHORITY AND CONTRACTOR.

For the manufacture of road tar emulsions, vertical-retort tar is particularly suitable. The rather higher tar acid content of many vertical-retort tars becomes a distinct advantage, since,

with the addition of a carefully regulated quantity of caustic soda (or other alkali), compounds of the sodium phenate type are formed, which are excellent emulsifying agents.

The low "free carbon" content of vertical-retort tars is also an advantage, as it is found that "free carbon" is very difficult to emulsify, and the lower the factor is in the tar, the greater is the ease with which emulsification can be effected.

PITCH FROM VERTICAL RETORT TAR.

When vertical and horizontal retort tars are distilled to the same temperature or to the same consistency of the residue, it is found that the pitch from horizontal-retort tar has become brittle and practically valueless, but the pitch from vertical-retort tar still retains a semi-viscosity or fluidity which is extremely valuable when the pitch is used as a binder and has to withstand shock. When used either on the road or in briquettes, a binding material which has become brittle will rapidly cause serious disintegration.

The "paraffiny" nature of vertical-retort pitch combined with the low "free-carbon" content appears to confer upon this material the necessary elasticity required to withstand shock of traffic and rough handling. To the same characteristics of this pitch may be attributed the marked stability and resistance to weathering, of which there is considerable evidence.

The use of pitch rather than bitumen for the production of such so-called "bitumen mixtures" is desirable from several points of view; and where such mixtures have to be prepared, the substitution of pitch for bitumen is to be recommended on several grounds—viz.: (1) The cost would be less, since pitch is cheaper than bitumen. (2) The necessity for importing bitumen would be avoided, and a domestic product used. (3) The mixture will be more homogeneous and stable, since pitch is more closely akin to tar than is bitumen.

This blending is only recommended as a means for overcoming a difficulty which arises in the case of exceptional tars, and not as an ideal method for preparing road tars. Too much emphasis cannot be laid on the advantages of preparing straight-run tars, as is the common procedure with vertical retort tar, and the elimination of "cutting back" as far as possible. Another point which has proved to be of considerable importance is that the road tars which give the best results are not those whose consistency is just over the lower limit of specification, but rather those approaching the upper limits, in the case of both No. 1 and No. 2 tars.

INFLUENCE OF CARBONIZING CONDITIONS UPON THE FREE CARBON CONTENT OF TAR.

By H. HOLLINGS, M.Sc., Chief Gas Chemist of the Gas Light and Coke Company.

For several reasons the free carbon content of ordinary high-temperature coal tar is a most important characteristic. Not only does it govern to a marked degree the quality of the pitch for briquetting purposes, or of the dehydrated tar for road purposes, which can be produced from the crude tar, but it is found that it is also an index of other properties of the tar, and that within limits there is a relationship between the free carbon content and the yield of tar per unit of coal.

It is the object of this note to present certain data relating to the influence of carbonizing conditions in horizontal retorts upon the free carbon content of the tar, rather than to enunciate any new principles or to discuss the relative merits of rival carbonizing systems as tar producers. While it is well known that relatively large quantities of free carbon are symptomatic of relatively high temperatures and large free spaces within the retort, there is little information available as a basis for the evaluation of the relative importance of such factors. A really scientific study of the matter, such as many would desire to make, presents many difficulties; and owing to the complexity of the reactions involved, some years must elapse before it can be made. Therefore it may be of some value to place on record the results of some rather empirical experiments which have been carried out in connection with the carbonizing of Durham coals in horizontal gas retorts on a normal working scale.

In connection with several investigations, an examination has been made of the tars formed under different conditions in different retorts. In some cases the retorts have been in experimental settings, but in all cases they have been of full size, the length being from 20 to 23 ft., and the section as shown below. The samples (excepting that marked E) to which reference is made in the table did not include the tar which separates in the condensers; it has been found, however, that the free carbon content of the tar which separates from the gas before the condensers is only slightly higher than the average. The weight of each charge of coal is expressed in pounds per cubic foot of retort space, to facilitate comparison between one retort and another. The temperatures recorded are those of the hottest zones of the combustion chambers surrounding the retorts. In all cases the time of carbonization is that found necessary in practice for complete carbonization under the conditions indicated by the weight of the charge and the temperature.

INFLUENCE OF FREE SPACE.

Reference to the results marked A, B, C, and D, which were all obtained when using retorts with a section of 22 in. by 16 in., shows that as the weight of the coal charge was progressively decreased from 35·5 lbs. to 29 lbs. per c.ft. of retort space, there was an increase in the free carbon content of the tar from 12·1 to 20·8 p.ct. This increase was particularly significant in the case of test D, since it was obtained in spite of a slightly lower carbonizing temperature. Further reference is made below to the result E, which was obtained at the much lower temperature of 1253°.

The results marked F and G were obtained with a slightly larger section of retort, and again they show the extent to which the free carbon content of the tar is increased by a reduction in the weight of charge of coal, notwithstanding a reduction of 14° in the temperature.

The results J, K, and L were obtained with deeper retorts, and show the same effect. It should be noted that in the last example the temperature was necessarily reduced to 1332°; but notwithstanding this there was a striking increase in the free carbon in the tar.

Ref.	Section of Retort. (Inches).	Weight of Coal (Lbs. per C.Ft.).	Temperature, °C.	Time (Hours).	Free Carbon in Tar. (Dry Basis.) P.Ct.
A	22 by 16	35·5	1359	10·2	12·1
B	,,	34·9	1376	10·1	13·1
C	,,	34·5	1346	10·2	13·4
D	,,	29·0	1320	10·6	20·8
E	,,	28·4	1253	12·6	12·3
F	23 by 16	31·0	1348	11·2	20·8
G	,,	28·4	1334	11·2	24·6
H	24 by 16	34·6	1378	10·0	11·7
J	24 by 18	36·4	1381	12·2	14·5
K	,,	35·5	1378	12·2	17·5
L	,,	26·8	1332	10·6	27·6

INFLUENCE OF TEMPERATURE.

There are several instances in the above results where the free carbon content of the tar increased with a decrease of the coal charge, though there was a slight decrease in the carbonizing temperature; but it must not be overlooked that any substantial decrease in temperature has a marked effect upon the extent to which the hydrocarbon vapours are cracked within the retort. This is seen most clearly by comparing the result marked E, which was obtained at a temperature of 1253°, with the results marked D and G, which were obtained at higher temperatures but with about the same weight of coal charge per unit volume of retort space. The reduction of the temperature by about 80° appears to be responsible for a reduction of about 12 p.ct. in the free carbon under these conditions.

Consideration of the figures given above leads to the conclusion that with any given retort the most important factor affecting the quality of the tar is the relative weight of each charge of coal placed in the retort. The influence of temperature of carbonization is by no means negligible, but any attempt to improve the quality of an unsatisfactory tar by reducing the combustion chamber temperature would appear to necessitate a reduction of the temperature below that which is required for the maintenance of such throughputs of coal as are essential for economical working. There may be cases, however, in which the quality of the tar may be improved by increasing the weight of each charge of coal placed in the retort. Such an alteration in working conditions can often be made without any serious difficulty; indeed, it may give rise to improvements in other directions, some of which improvements may prove to be of greater importance than the particular one to which attention is now being directed.

INFLUENCE OF LEAKAGE THROUGH RETORTS.

It is a matter of general experience that, whenever there is a leakage of air into the retorts, or the retort fittings, there is a danger that high local temperatures may be obtained near the mouthpiece of the retort, due to combustion of a part of the gas. Such high temperatures result in decomposition of tar vapours with the formation of free carbon. The author

has no quantitative information as to the influence of this factor. The retorts in connection with which these results were obtained were in good working condition, but they were not new except in the case marked H. This should be noted, because it may explain in part the slight discrepancy between this result and the results A and B.

INFLUENCE OF SIZE OF RETORT.

Although the nature of the influence of temperature and free space upon the quality of tar has been well understood, the influence of design of retort has not been so generally appreciated. No mathematical treatment of the results given in the table is possible; but it is significant that if a graph is plotted for the relationship between free carbon in tar and weight of coal from the results J, K, and L, for the retort 18 in. deep, it is found on plotting any one of the results obtained from retorts 16 in. deep that the free carbon content is lower than might have been anticipated from the results J, K, and L. This suggests that it is easier to obtain tars of low free carbon content from the smaller size of retort.

An important confirmation of the influence of the size of retort was obtained in connection with an experimental setting in which retorts 24 in. by 18 in. in cross-section were set alongside retorts 21 in. by 15 in. in cross-section. Each type of retort was fully charged with exactly the same kind of coal, and was heated to the same external temperature, about 1,400°. The weight of coal charged per c.ft. of retort space was about 36 lbs.

The tar obtained from the 24 in. by 18 in. retorts was found to contain 18·8 p.ct. of free carbon, while that obtained from the 21 in. by 15 in. retorts contained only 9·8 p.ct.

The essential difference between the conditions in the two retorts appears to be that it was necessary to carbonize the deeper mass of coal in the deeper retort for about two hours longer than was necessary for the complete carbonization of the coal in the smaller retort. During this period of two hours the volatile products from the centre of the large coal charge came into contact with coke, and passed through a free space in contact with the retort wall at a temperature higher than that during the earlier part of the carbonizing process. Furthermore, in the case of the large coal charge, a greater proportion of the primary tar was evolved at a time when the gas velocity in the retort was relatively low, and hence it was subjected to the high-temperature treatment for a longer time. Thus at least a portion of the volatile matter from the larger coal charge was subjected to more drastic thermal decomposition. In so far as such increased decomposition takes place in contact with coke, it is not to be anticipated that the tar will contain the whole of the resultant free carbon, since the coke will remove some of the solid decomposition residues by filtration; but there must be some increased thermal decomposition in the free space due to the higher temperature of the free space and to the lower gas velocity in the free space towards the end of the longer carbonizing period in the larger retort. Thus the smaller size of retort in horizontal-retort practice appears to be advantageous when considered from this particular point of view, but the economic importance of other considerations must not be overlooked.

SOME OBSERVATIONS ON COAL TARS FROM STEAMED VERTICAL GAS RETORTS.

By A. PARKER, D Sc., F.I.C., M.I.Chem.E., Research Chemist to the Joint Research Committee of the University of Leeds and the Institution of Gas Engineers.

The amounts and properties of the tars obtained during the dry distillation of bituminous coal differ considerably according to the nature and state of division of the coal, the temperature of carbonization, the rate of heating, the design of plant employed, and other factors. The design of plant influences the time during which the vapours of the primary products suffer degradation by exposure to temperatures higher than those at which the products are first formed. When coal is distilled in horizontal retorts at the high temperatures ordinarily adopted in the gas industry, the yield of tar is less than when the carbonization is carried out at comparatively low temperatures of approximately 600°. The lower yields of tar in the high-temperature process are accounted for by the secondary thermal decomposition of the primary tar first evolved from the coal as its temperature is being raised. Further, the compositions of these two distinct types of tar, obtained by the carbonization of coal in horizontal retorts at high and low temperatures, differ greatly from one another. High-temperature tar, which has a specific gravity of the order of 1·20 at 15·5°, consists mainly of aromatic hydrocarbons, phenols, naphthalene, anthracene, and pyridine bases, and contains a large amount of "free carbon;" whereas low-temperature tar has a comparatively low specific gravity of about 1·03, contains very little "free carbon," and its constituents include paraffins and naphthalenes.

The marked differences in the tars obtained from the high-temperature carbonization of coal in continuous vertical retorts and those obtained in horizontal retort practice are due to the fact that in continuous vertical retorts the coal is submitted to a more gradual rise in temperature, with the result that the primary tar products are removed from the top of the retort without having undergone so much degradation by long exposure at high temperatures. Continuous vertical retort tars may, therefore, be classed as intermediate between high-temperature and low-temperature horizontal retort tars. The passage of steam upwards through vertical retorts reduces the amount of secondary decomposition of the tar produced, by removing the products more rapidly from the retort, and by ensuring more uniform heating of the coal as it descends—provided the physical state of the charge is such as to allow the undecomposed steam and the gases formed in the lower sections of the retorts to pass freely through, and impart heat to, the charge in the upper sections.

INFLUENCE OF SIZE OF COAL.

Coal charged in the form of screened nuts more readily allows the flow of gases and steam than coal charged in a more finely divided condition, and should, therefore, give larger yields of tar which has undergone less thermal decomposition. The influence of the state of division of the coal in continuous vertical retort practice has recently been demonstrated by T. F. E. Rhead,[1] who found that when a particular coal, graded to pass through a 3-in. screen, but to remain on a 1¼-in. screen, was carbonized at high temperature in Woodall-Duckham continuous vertical retorts supplied with an amount of steam equivalent to 10 p.ct. of the weight of coal, a yield of 17 gallons of tar was obtained per ton of coal carbonized; but when this coal, previously passed through the usual breaker and containing 90 p.ct. below 2 in., was carbonized under the same conditions, the yield of tar was reduced by 4 gallons, to 13 gallons per ton of coal.

In horizontal retort practice, with heavy charges, the size of coal influences the path of travel of the gases and tar vapours produced during the carbonization. With large coal the vapours can escape in greater proportion through the cooler inner portions of the charge; but with coal in a finely divided condition, a larger proportion of the gases must travel through the hot coke and free space adjacent to the retort walls, and thereby suffer degradation. It would thus be expected that the yields of tar would be greater in high-temperature horizontal retorts with coal in the form of screened nuts than with coal in a finely divided condition; although owing to the very much smaller part played by internal heating, the influence of coal size on tar yield may not be so great as with continuous vertical retorts. In a recent investigation[2] carried out by the Joint Research Committee of the University of Leeds and the Institution of Gas Engineers, five grades of sizes of a Nottinghamshire coal were carbonized under identical conditions in an experimental retort at high temperature. The largest grade passed through a screen with 1¼-in. mesh and remained on a ¾-in. screen; the limiting sizes of the smallest of the five grades being 10 meshes and 30 meshes to the inch. In this investigation it was found that the yield of tar progressively decreased as the sizes of the coal particles were diminished; at the same time the naphthalene and "free carbon" contents of the tars increased, demonstrating that the tar vapours from the smaller grades of coal had undergone greater thermal decomposition.

STEAMING IN VERTICAL RETORTS.

An inquiry by the Joint Committee of the University of Leeds and the Institution of Gas Engineers[3] into the thermal and chemical efficiencies of methods of manufacture of different grades of gas, was commenced in 1919 by an investigation of the process of steaming the charges in the retorts of the Glover-West continuous vertical installation at the works of the Bothwell and Uddingston Gas Company. The data obtained during this investigation included the quantities of tar produced per ton of coal carbonized; and samples of the tar were collected and examined. Five complete tests were conducted. In the first test no steam was passed into the retorts, but in the other tests steam was admitted in determined amounts, the largest quantity being supplied in the fifth test. The coal

[1] "GAS JOURNAL," 1926, **175**, 843

[2] Sixteenth Report, "GAS JOURNAL," 1926, **175**, 802.

[3] Fourth Report, Trans. Inst. Gas Eng., 1920, 259.

used throughout the investigation was obtained in the form of washed nuts from Bothwell Colliery. The results of proximate analyses of samples of the coal, as charged into the retorts, are given in Table I.

TABLE I.—*Proximate Analyses of Coal, Bothwell Washed Nuts.*

Test No.	1.	2.	3.	4.	5.
Moisture	9·8	10·9	10·1	10·5	10·3
Volatile matter	32·7	32·4	32·5	32·6	33·1
Fixed carbon	51·2	50·6	49·8	50·6	50·7
Ash	6·3	6·1	7·6	6·3	5·9

The principal conditions of operation during the tests carried out at Uddingston, and the amounts of tar collected, are set out in Table II.

TABLE II —*Steaming in Continuous Vertical Retorts, Bothwell Washed Nuts.*

Results per Ton of Coal as Supplied.

Test No.	1.	2.	3.	4.	5.
Average temperature, combustion chambers	1211°	1139°	1177°	1186°	1090°
Average temperature, circulating chambers	1115°	978°	1129°	1128°	1096°
Coal per retort per day, tons	3·1	3·3	3·7	3·4	3·1
Steam passed through retorts, p.ct. weight of coal	*Nil*	6·0	11·3	21·8	23·7
Gas made—					
Volume, c.ft. per ton	9370	12,670	15,220	17,810	19,590
Calorific value, B.Th.U. per c.ft.	544	482	447	436	410
Therms per ton of coal	51·0	61·0	68·0	77·7	80·3
Tar (dry) in gallons per ton	13·2	16·4	16·8	20·4	21·2

From the figures given in these two tables it may be seen that the coal as charged contained from 9·8 to 10·9 p.ct. of moisture, and that the ash content ranged from 5·9 to 7·6 p.ct.; the quality of the coal being, therefore, approximately the same in all five tests. The amounts of steam passed into the retorts are expressed as percentages by weight of the coal carbonized. The quantities of steam supplied through the nozzles situated near the lower ends of the retorts were greater than those given in the table; but the necessary deductions have been made for the amounts lost by condensation and leakage from the coke chamber doors. The tests are arranged in order according to the proportions of steam passed into the retorts. In the first test no steam was injected, and in the fifth test the amount was equivalent to 23·7 p.ct. of the weight of coal supplied. The amount of dry tar obtained rose with increasing amounts of steam from 13·2 gallons per ton of coal in Test 1 to 21·2 gallons in Test 5. It must be remembered that the coal was charged into the retorts in the form of nuts; and since this coal is not of particularly good coking properties, the gases and vapours produced in the lower sections of the retorts would move comparatively freely through, and impart heat to, the charges in the upper sections. This fact probably accounts in some measure for the great increases in yields of tar as larger quantities of steam were employed.

The results obtained at Uddingston were confirmed by work on the same subject carried out by the Fuel Research Board at their East Greenwich Station.[4] For example, Mitchell Main gas nuts carbonized without steam in continuous vertical retorts at high temperature gave 9·3 gallons of tar per ton of coal, and the yield of tar was increased to 12·6 gallons per ton of coal with 30 p.ct. of steam admitted to the retorts.

EXAMINATION OF SAMPLES OF TAR.

The specific gravities, calorific values, and the results of ultimate analyses of the tars obtained from Bothwell nuts, in the investigation carried out at Uddingston by the Joint Research Committee, are given in Table III.; the amounts of "free carbon" in the tars are also included. The data given in this table do not show any important differences except in the figures for "free carbon," the amount of which decreased from 1·5 p.ct. in Test 1 without steam to 0·4 p.ct. in Test 5 with 23·7 p.ct. of steam, indicating a gradual reduction in the amount of secondary thermal decomposition. Results leading to the same conclusion were also obtained by the Fuel Research Board; the percentages of "free carbon" in the tars from Mitchell Main gas nuts falling from 9·2 in the test without steam to 5·4 in the test with steaming to the extent of 30 p.ct. of the weight of coal carbonized.

EVALUATION OF TAR BY DISTILLATION.

The samples of tar obtained at Uddingston were also examined. The results obtained are given in Table IV. From this table it may be seen that the proportion of liquor, in general, increased with larger quantities of steam admitted to the retorts; but no real difficulty, due to tendency of the tar to emulsify, was experienced in any of the tests. The percentages of 50/90 benzole were comparatively low, and

[4] Report of the Fuel Research Board for the years 1920, 1921. First Section, Steaming in Vertical Gas Retorts.

TABLE III.—*Analyses of Tar from Bothwell Washed Nuts (Uddingston).*

Test No.	1.	2.	3.	4.	5.
Steam passed through retorts, p.ct. weight of coal	*Nil*	6·0	11·3	21·8	23·7
Ultimate analysis of dry tar—					
Ash	0·1	0·1	0·1	0·1	0·1
Carbon	85·6	84·5	84·1	84·7	84·3
Hydrogen	7·4	7·3	7·4	7·6	7·6
Sulphur	0·7	1·0	0·7	0·8	0·9
Nitrogen	1·8	1·7	1·7	1·6	1·7
Oxygen (by difference)	4·4	5·4	6·0	5·2	5·4
Calorific value (gross) of dry tar in B.Th.U. per lb.	16,450	16,230	15,900	16,150	16,130
Specific gravity of tar at 15·5°	1·083	1·083	1·082	1·081	1·082
Free carbon in tar, p.ct. by weight	1·5	1·3	1·1	0·7	0·4

gradually decreased from 0·34 in Test 1 to 0·23 in Test 5. The amounts of 90/160 naphtha and 90/190 naphtha remained practically constant throughout the tests. The yields of 60° Fahr. carbolic acid were low, although, from the losses on alkali washing, it was found that the amounts of higher carbolics were comparatively large—from 3 to 4 p.ct. of the tar by volume in the first fractionation to 200°. The amounts given under the heading creosote and anthracene oil decreased with greater steaming from 48·3 to 38·2 p.ct. by volume, but the yields of medium soft pitch increased from 48·5 to 56·9 p.ct. by weight. The percentages of benzene and toluene, which contained large proportions of paraffins, were small, as is common with coals of this type, and, in general, decreased with larger quantities of steam admitted to the retorts.

TABLE IV.—*Laboratory Distillation of Tar from Bothwell Washed Nuts (Uddingston).*

Test No.	1.	2.	3.	4.	5.
Steam passed into retorts, p.ct. weight of coal	*Nil*	6·0	11·3	21·8	23·7
Percentage by volume—					
Liquor	2·62	3·41	4·71	5·40	5·33
50/90 benzole	0·34	0·31	0·31	0·26	0·23
90/160 naphtha	0·81	0·93	0·87	0·88	0·65
90/190 ,,	1·65	1·46	1·34	1·64	1·49
60° Fahr. carbolic	0·24	0·24	0·23	0·24	0·25
Creosote, anthracene, and tar acids	48·27	44·10	40·87	38·63	38·22
Benzene with paraffin	0·30	0·29	0·30	0·24	0·15
,, (corrected)	0·24	0·24	0·24	0·20	0·12
Toluene with paraffin	0·30	0·25	0·25	0·29	0·24
,, (corrected)	0·27	0·23	0·23	0·27	0·22
Percentage by weight—					
Pitch (medium soft)	48·5	49·8	52·8	53·6	56·9

The yields of tar products, calculated per ton of coal as charged to the retorts, appear in Table V., which shows increases from Test 1 to Test 5 in the amounts of 90/190 naphtha, 60° Fahr. carbolic acid, creosote, and anthracene oils, toluene and pitch; but the yields of 50/90 benzole and benzene remained about the same throughout. In any consideration of these results the character of the coal employed must be taken into account.

TABLE V.—*Products of Distillation of Tar per Ton of Bothwell Nuts (Uddingston).*

Test No.	1.	2.	3.	4.	5.
Gallons—					
50/90 benzole	0·046	0·053	0·055	0·056	0·052
90/160 naphtha	0·110	0·159	0·154	0·190	0·146
90/190 ,,	0·224	0·248	0·236	0·354	0·334
60° Fahr. carbolic	0·032	0·041	0·040	0·052	0·056
Creosote and anthracene oils	6·52	7·50	7·20	8·34	8·56
Benzene with paraffin	0·041	0·049	0·053	0·052	0·034
,, (corrected)	0·032	0·041	0·042	0·043	0·027
Toluene with paraffin	0·041	0·043	0·044	0·063	0·054
,, (corrected)	0·037	0·039	0·040	0·058	0·049
Pitch (medium soft), cwt.	0·63	0·82	0·90	1·12	1·23

Since it is more usual in laboratory distillations of tar to express the results as percentage volumes collected through different ranges of temperature with break points at 230° and 270°, the figures obtained in the preliminary distillations with the tars collected at Uddingston are given in Table VI.

TABLE VI.—*Preliminary Distillation of Tar from Bothwell Nuts (Uddingston).*

Test No.	1.	2.	3.	4.	5.
Volume p.ct. on dry tar—					
Below 230°	12·6	12·4	11·7	10·7	10·6
230°—270°	15·2	17·1	16·3	14·0	15·8
Above 270°	26·0	23·8	21·4	18·7	17·4
Total	53·8	53·3	49·4	43·4	43·8

These figures show that with increasing amounts of steam supplied to the retorts, reductions occurred in the volumes of distillates collected below 230°, above 270°, and in the total volumes. In considering these figures for preliminary distillations without a fractionating column, the type and size of still used must be taken into account; and even with the same still it is no simple matter to repeat the results for the same sample of tar with the degree of agreement desirable in quantitative laboratory experiments.

DESIRABILITY OF A STANDARD LABORATORY DISTILLATION TEST.

The author is convinced that a standard simple laboratory distillation test is urgently required, so that truly comparative results for different tars may be obtained.

There is no doubt that a standard test would require to be carried out in a still of specified dimensions, and with the method of heating also specified as nearly as possible. The oils collected in the first distillation would then presumably be separated from water, and submitted to a second standardized distillation, probably with a fractionating column. Beyond this second distillation, standardization may not be desirable, but the fractions so obtained could be examined by special methods varying with requirements. The author suggests that by an exchange of views those experienced in laboratory and in commercial distillation of tar should be able to devise a useful specification for a standard yet simple distillation test.

[There was an appendix to the paper, in which the author described the method of evaluation of the tars collected at Uddingston.]

Dr. PARKER added that, in connection with a standard test, the end point of distillation was important. In many recent papers—indeed, in the one by Messrs. Sinnatt and King—it was stated that a certain type of tar gave a brittle pitch or a soft pitch, and so on. In his view, the quality of the pitch was influenced as much, if not more, by the type of distillation—*i.e.*, the stage to which the distillation had been carried—as by the quality of the original tar. This was a point which ought to be borne in mind. Further, in a standard test, the question of temperature measurement required consideration. It was simple to obtain reliable thermometers up to temperatures of about 250° C.; but when one came to the distillation of pitch, at temperatures as high as 350° C., mercury thermometers of any kind were unreliable—at any rate after a little use. It was necessary to re-calibrate them repeatedly, owing to changes in the volume of the bulb containing the mercury.

NOTES ON VERTICAL RETORT TAR.

By J. MACLEOD, F.I.C, M.I.Chem.E, C. CHAPMAN, A.I.C., A.M.I.Chem.E., and T. A. WILSON, F.I.C., A.R.T.C.

[Extract.]

The increasing production of vertical retort tar is compelling distillers to reconsider their methods of refining; and it is the object of the authors to indicate some of the essential differences between this tar and the tar produced by other systems of carbonization, basing their observations on experience in refining tar produced entirely from the continuous type of vertical retorts at the Provan Works of the Glasgow Corporation, and also on experience gained at the three other Glasgow Corporation Works—viz., Dawsholm (mixed horizontal and Wilson vertical tar), Dalmarnock (Wilson vertical tar), and Tradeston (horizontal tar only).

The particular coal used in the production of the vertical retort tar discussed later comes from the Edge coal group of the lower carboniferous system deposited during a period of volcanic activity, and may be classified as of moderate coking power—not a particularly "fat" coal.

The Provan Station of the Glasgow Corporation is an installation of Woodall-Duckham continuous vertical retorts comprising 8 settings of 24 retorts capable of handling 1356 tons of coal per day of 24 hours, the charge being 7 tons per retort. The yield of tar averages about 15 gallons per ton of coal, the yearly production being 5,700,000 gallons (27,500 tons). The coal used is mainly Lanarkshire gas coal (37 p.ct. volatile, 7 p.ct. ash). This tar is distilled as received, without admixture, and the oils obtained are refined along with tar distillates from the other three Glasgow Corporation tar works. The proportion of oil from other than vertical retorts is not more than 5 p.ct., and such oils are for the most part handled separately.

The relation of Provan tar to other tars produced under different conditions and from different coal is shown in a few laboratory analyses appended (Table 1).

It will be seen that the quality of tar varies with both the coal used and the retort employed.

A more direct comparison of the effects of the different retorts when using the same coal may be quoted (Table 2) from the records of the Glasgow Corporation Chemical Works.

TABLE 2.—*Works Distillation of Tar from Scottish Coal.*

—	Provan Vertical Retorts.		Tradeston Horizontals.	
Sp. gr.	1·085		1·175	
	P.Ct. Yield.	Sp. Gr.	P.Ct. Yield.	Sp. Gr.
Ammonia water	2·6	1·018	3·0	1·003
Crude naphtha	1·57	0·864	1·34	0·925
Light oil	10·77	0·962	6·02	1·007
Middle oil	17·00	0·988	6·18	1·025
Heavy oil	20·75	1·021	16·32	1·045
Pitch	45·00	1·120	65·56	1·280
	97·69		98·42	

TABLE 1.

Producer	Glasgow Corporation, Dalmarnock	Glasgow Corporation, Provan (New)	Glasgow Corporation, Provan (Old)	Glasgow Corporation, Tradeston	South Metropolitan	Messrs. J. Nimmo and Co., Ltd., Auchengeich
Type of retort	Maclaurin low temperature	Vertical	Horizontal	Horizontal (high heats)	Horizontal	Coke ovens (ultra narrow)
Coal used	Lanarkshire gas	Lanarkshire gas	Lanarkshire gas	Lanarkshire gas	Durham and foreign	Auchengeich Colliery (Lanark)
Yield of tar (gals. per ton of coal)	16·5	14·8	11·0	10·8	..	6·0
Sp. gr. of tar	1·050	1·075	1·180	1·212	1·156	1·264
Crude naphtha (gals. per ton)	25·2 (sp. gr. 0·940)	20·3 (sp. gr. 0·922)	6·0 (sp. gr. 0·928)	13·7	12·1	2·0
Light oil " "	47·9 (sp. gr. 0·973)	30·0 (sp. gr. 0·983)	20·0 (sp. gr. 1·000)	19·0	34 1	22·8
Middle oil " "	26·6 (sp. gr. 1·000)	21·7 (sp. gr. 1·013)	20·0 (sp. gr. 1·026)	11·7	19·4	9·2
Heavy oil " "	4·4 (sp. gr. 1·013)	35·0 (sp. gr. 1·034)	20·0 (sp. gr. 1·048)	1·6	4·7	1·6
Pitch (cwt.)	10·4	9·72	13·66	14·57	12·94	15·64

NOTE.—**In the case of the Maclaurin tar, the conditions of production are such that a great part of the lower-boiling oils are not condensed in the tar main; thus an apparently heavier tar results.**

TABLE 3.—*Analysis of Various Tars showing comparison with Vertical Retort Tar, expressed in Gallons per Ton of Tar.*

Product.	Maclaurin Process.	Provan Vertical.	Provan Horizontal.	Tradeston Horizontal (High Heats).	South Metropolitan Horizontal.	Auchengeich (Ultra-Narrow) Coke Ovens.
Motor spirit	0·05 (sp. gr. 0·854)	0·30 (sp. gr. 0·858)	1·60 (sp. gr. 0·875)	0·04	0·45	..
Light solvent	0·56 (sp. gr. 0·820)	0·28 (sp. gr. 0·844)	1·12	0·25	1·07	..
90/160 "	0·66	0·97 (sp. gr. 0·835)	2·66	0·16	0·45	..
90/190 "	1·77	2·23	3·37	0·37	0·75	..
	—3·04	—3·78	—8·75	—0·82	—2·72	—0·3
Unsaturated compounds	1·27	2·10	..	0·31	1·75	..
Pyridine bases	1·79	3·91	1·60	2·73	2·67	Trace
Crude tar acids	41·0	18·72	10·56	6·95	5·74	0·14
Crude naphthalene	*Nil*	*Nil*	112 lbs.	130 lbs.	152·1 lbs.	88·0 lbs.
Crude anthracene	*Nil*	*Nil*	*Nil*	*Nil*	21·9 "	28 0 "
Creosote	56·0	77·40	34·3	20·9	42·34	23·0
Pitch	10·40 cwt.	9·72 cwt.	13·66 cwt.	14·57 cwt.	12·94 cwt.	15·64 cwt.

The specific gravity of the creosote at the finish of the distillation at the tar stills shows very clearly the different characteristics of these tars. At Provan the finishing point is 1·070 at 60° Fahr., and at Tradeston 1·110 at 60° Fahr. when distilling to pitch.

The oils obtained in the laboratory analyses quoted in Table 1 were analysed in terms of finished products (Table 3).

The presence of paraffins in the low-temperature and vertical retort tars can be immediately detected on examination of the specific gravities of the various fractions shown in Tables 1 and 3. The phenols present show marked differences in distillation range:

TABLE 4.—*Distillation Ranges of Phenols Extracted from the Oil Obtained from Various Tars.*

Temp. °C.	Maclaurin.	Provan Vertical.	Tradeston Horizontal.	South Metropolitan Horizontal.	Auchengeich Coke Oven.
190	..	..	..	3	..
195	..	..	4	8	4
200	3·5	4	31	37	6
205	11·0	21	56	60	14
210	24·0	38	71	74	28
215	36·5	50	79	83	43
220	50	57	84	88	54
230	65	70	90	94	66
240	75	75	94	..	71
250	80	80	..	..	77
260	85	83	..	..	79
270	90	87	..	..	84
280	92	90	..	..	86
290	94	94	..	..	88
300	..	..	..	..	90

THE TAR ACIDS PROBLEM.

On changing over from horizontal to vertical retort tar as the source of the products for refining, the greatest difficulty to contend with was encountered in the phenol section. Apart from the greater quantity of high-boiling acid, and the reduced output of carbolic acid, there was apparently no variation to call for altering our methods. The total absence of crystallizable naphthalene made the process easier of manipulation. It was not long, however, before it was evident that the new type of cresylic acid had the property of darkening very rapidly, even when stored in closed vessels; and under the influence of light and air the darkening was only a matter of a few hours. If the distillate was allowed to run warm from the coil-end, it was tinted immediately, and was opaque brownish-black within a week. This was naturally a serious matter, as redistillation was merely a palliative. There was a resinous residue after re-distillation, but the fresh acid showed the same darkening tendency.

The method in common use to take out the traces of pink colouring matter from ordinary cresylic acids derived from coke-oven and horizontal retort creosotes was of no avail in the present case of vertical retort creosotes.

THE PITCH POSITION.

It has been frequently asserted that vertical retort tar pitch is inferior to horizontal pitch for use as a binder in briquette making; and we have endeavoured for some time to discover what basis there is for such assertions. Makers of briquettes claim that a higher proportion of vertical pitch is required to give the same stability to the finished article—in other words, the binding power is less.

The problem is more complex than it appears at first. It is difficult to devise tests to indicate the briquette-making efficiency of a particular pitch. Binding power is probably not the only factor; there must also be reasonably high resistance to the damaging effect of transport, and many briquette manufacturers require a certain gloss on their articles.

A series of tests was carried out on various tars representing different systems of carbonization, and the results are given in Table 5. The tensile strengths were determined in a cement-testing machine, and the figures given are the mean of six or eight tests. The "pitch cement" is a mixture of equal parts by weight of pitch and whinstone dust which passes 80 and remains on 100 mesh sieves. This test gives some indication of the relative binding power, but is not strictly reliable, since there is marked elongation of the moulded samples before fracture in the case of the softer pitches.

When the pitches are powdered, and rubbed on paper, the smear is distinctive for each type, and ranges from a reddish-brown, through chocolate, to black.

From the above table it would appear that the high-heat tars give pitches of greater binding power; but this is largely compensated for by a greater elasticity in the pitches from the other tars.

It has been asserted that the free carbon content is an index of the briquetting efficiency of a pitch, but the addition of free carbon (extracted from pitch) as a filler does not bring the tensile strength of vertical pitch up to that of coke-oven pitch. The increase in tensile strength is just the same when any fine powder is added. If a pitch is produced by distilling vertical retort tar up to 400°, the free carbon content is about 35 p.ct., and the pitch is, of course, very brittle and of high melting-point. Upon adding heavy oil to reduce this melting-point to

TABLE 5.—*Comparative Tensile Strengths of Various Pitches.*

Source of Tar.	Glasgow Maclaurin Low Temperature.	Glasgow Provan Vertical.	South Metropolitan Horizontal.	Glasgow Tradeston Horizontal.	James Nimmo & Co., Ltd., Auchengeich Narrow Ovens.
Sp. gr. of tar . .	1·050	1·075	1·156	1·212	1·264
Yield of pitch, p.ct.	52	48·6	64·7	72·8	78·2
Sp. gr. of pitch. .	1·17	1·20	1·29	1·28	1·40
Twist point, °C. .	40	45	50	45	40
Air m.p., °C. (Hutchinson tester) .	74·2	88·3	96	89·7	84·2
Ring and ball m.p., °C.	65	77·2	78·2	77·2	67·5
Water m.p., °C. (Spielmann and Petrie). . . .	46	48·2	65	48	45
Free carbon, p.ct. .	5	10	..	34	32
Tensile strength, lbs. per sq. in. .	56 av. (45–70)	63	90	104	171 av. (130–215)
Pitch cement, tensile strength . .	230 av. (190–290)	211	310	over 400	over 400
Appearance of fracture	bright, very glossy	bright and glossy	bright	dull, greyish	dull, black

70° or 75°, a pitch results with a tensile strength of 140 lbs.—equal to coke-oven pitch in this respect—but the binding power is not increased correspondingly, as the pitch remains brittle.

Briquette makers contend that, while it is possible to use only 8 p.ct. by weight of horizontal retort and coke-oven pitch, 9 p.ct. or more of vertical retort pitch is required. A leading manufacturer of briquettes was asked to try out two separate truckloads of pitch, using the same proportion in each case, and to compare the results. The report was that there was no difference in the practical results; yet one was vertical retort tar pitch and the other horizontal.

A briquette plant has been running for some months in the Dalmarnock Works of the Glasgow Corporation, using pitch from the vertical retort tar, and the finished briquette is declared highly satisfactory in appearance and use. The whole of the Department's pitch production has always been disposed of at current prices with no difficulty, and the pitch bays at the time of writing are absolutely empty. We are of the opinion that there existed an unfair prejudice against vertical retort tar pitch, possibly founded upon its different appearance, and the fact that it fractures readily into small pieces. This can be overcome by adding a filler equivalent in quantity to the useless "free carbon" of other grades of pitch, and thus using up part of its inherent binding property. The bituminous content, and not the inactive free carbon, is the binding agent.

From the foregoing comparative analyses (Table 3) it will be seen that the tar from vertical retorts is in many respects of higher value to a distiller than the tar from other sources. The motor spirit content is low, but the total yield of rectified naphthas compares favourably with that from other tars. The high paraffin content of these naphthas is not detrimental to their value as solvents, but as sources of intermediates for dyestuffs the naphthas are practically useless. Pyridine bases are recoverable in fair quantity, and materially affect the value of the tar. The absence of salts is not a disadvantage. Less capital outlay for plant is called for, and there is a distinct saving of steam for heating purposes, while at the same time the oils produced for fuel purposes are clear and of low viscosity. The phenolic portion of the distillate is of higher value than the normal as regards both quantity and quality. The high-boiling acids have a good market value, and the yield of this grade is considerably in excess of that from any other tar; but against this high production must be placed the disadvantage that the acids are productive of red emulsions when used as disinfectants, and also show a marked disposition to become opaque brown or black, especially on exposure to light and air. This aspect has already been discussed.

The amount of pitch is far below the usual quantity, being balanced by the creosote yield; and with creosote and pitch at normal prices, the financial gain from the high creosote yield from vertical retort tar is considerable. Reckoned per ton of coal, the amount of pitch recovered is much the same from vertical retorts as from the horizontal type. The price of pitch has the greatest bearing on the relative values of the two tars; inflated prices bringing the total value of the horizontal tar more nearly to that of the vertical retort tar.

The financial balance is distinctly in favour of vertical retorts; and when it is recalled that the yield of tar is approximately 50 p.ct. greater from vertical retorts, the benefit accruing from a change from horizontal to vertical retorts can easily be seen.

Everything considered, vertical retort tar has many advantages over other tars from a distiller's point of view; the total value of the derivatives being higher, and refining both easier and cheaper except in the case of the tar acids.

Mr. MACLEOD, in some additional remarks, said that in Scotland they were faced with the distillation of a fairly highly oxygenated coal. Consequently the products differed consider-

ably from the products on the English side of the Border. A great deal had been heard about the specification for road tar; but in Scotland it would be an extremely difficult matter to meet the proposed specification. He was glad that the objections raised to it had resulted in Scotland being exempted from the new regulations for No. 1 tar. For the same reason, creosote had been exempted for some time from the specification of the B.E.S.A. The gravity allowed was much lower for the Scottish than for the English creosote. He thought that gravity had no effect upon creosote as regards the preservation of timber. He believed that the preservation depended upon the tar acids.

It had been stated that it was easy to remove tar acids. That statement had emanated from a place where the tar acids were 15 p.ct.; but in Glasgow they were 33 p.ct., and this made it a different problem.

DISCUSSIONS AT THE TAR CONFERENCE.

AFTERNOON SESSION.

Mr. W. J. CHADDER (Woodall-Duckham Vertical Retort Company) agreed with Mr. Adam that it would be difficult to produce road tars to the proposed specification from vertical retort tars. In fact, it would be practically impossible to prepare road tars with straight distillation from such tars. It had been proved, however, that good road tars could be made from vertical retort tars; and if they could not be made to conform to the proposed specification, why not introduce a special specification to meet vertical retort tars, or, failing that, make the new specification embrace both horizontal and vertical retort tars? Much of the trouble experienced with tars on the roads had been due to the surveyors themselves. In many parts of the country at the present time surveyors were using crude tar on the roads in preference to prepared tars. Failures due to that cause could not arise from any existing specification. This was a very important matter, when it was remembered that 50 p.ct. of the coal carbonized on gas-works to-day was carbonized in vertical retorts. Certainly efforts should not be in the direction of excluding vertical retort tar. In his opinion, the proposed specification was not a better specification than the existing one, if the existing one was tightened up. The proposed specification would also practically cut out the preparation of tars by local concerns, largely because they would not have the facilities to blend tars for treatment. The treatment of tar locally was quite a big thing to the gas concern; and by such treatment there was the possibility of reducing the price of gas to the consumer. Again, he suggested that the preparation of road tar was much more satisfactory if it was done by straight distillation, rather than by making the tar of a heavy consistency, and then oiling back with some foreign oil. The paper by Mr. Adam contributed little to the technique of testing road tars, which took into account cementation and durability. Apart from the specification, there was another point—viz., the specific gravity and free carbon figures. The author stated that these, supported by distillation figures, were of value as indicating the suitable nature of the original tar, and as showing the presence of hydrocarbons of good binding properties. It would, however, be interesting to know what evidence there was that some hydrocarbons had good binding qualities. Mr. Adam had claimed that this specification was designed to cover only such tars as would give satisfactory results in practice; but it did not cover vertical retort tars, which had been proved to give good results on roads. He would also be glad to know why a minimum specific gravity had been called for.

Mr. S. RACE (Devonshire Hospital) was interested in Mr. Adam's paper, because he was one of the original authors of the Road Board Specification. He had also had quite a number of years' experience with the use of tar and bitumen as road materials in North America. Something had been said about bitumen being greasy, and not standing climatic changes; but he had known bitumen surfaces which well withstood temperatures of over 100° in the shade in the summer and 34° below zero in the winter. There was a great difference between the proposed specification and the existing one; and he realized the disadvantages of the old specification. At the same time, he saw no reason why the free carbon should not be less than 12 p.ct. nor, in some cases, over 22 p.ct. With bitumen, which could be made into a good road surface just as tar could, there was 30 p.ct. free carbon, estimated by the usual methods. One particular road he knew had been made with bitumen in which the free carbon was very high; and it had withstood severe traffic conditions for over 25 years. At the same time, there was another road, made with equally good materials, but badly prepared, which did not withstand the traffic for more than eighteen months. A point which would have to be taken into consideration in connection with tar was the proper preparation of the materials and the nature of the aggregate and quality of it. Mr. Adam's paper suggested a tendency to get a material which was free from voids; and this was a practice which most road makers had found to be correct from the point of view of low cost of maintenance. At the same time, a balance must be struck, because if a material were made up absolutely free from voids, then the surface would be greasy.

SPECIFIC GRAVITY LIMITATION.

Mr. S. A. WIKNER (Tar Works Manager, Newcastle Gas Company) thought that a tightening-up of the specification would prevent bad tar from being sent out for road purposes, and would thus eliminate one of the reasons why competitors had been able to succeed. It was believed that a low specific gravity would admit tars which were known to be bad for road purposes, such as low-temperature tars, and that it was therefore advisable to state a limit for specific gravity. Admittedly some of the vertical tars with low specific gravity made good roads, but it was necessary to keep some others out; and there was a special clause which would allow some tars of lower specific gravity to come in, such as those from Scotland, because of their peculiar nature. It was felt that this covered the position as regards vertical retort tars. Nobody would say that the specific gravity or a certain percentage of free carbon could affect the action of a tar on the road; but a low specific gravity and free carbon indicated the method by which the tar was made. Generally speaking, low specific gravity and low free carbon content showed that the tar had been made in such a way that it had not good binding properties. This was why those preparing the specification had looked askance at low specific gravity. The quality of the original tar was all-important; and they must not lightly do away with restrictions which would improve the quality of the tar. It was agreed that the higher the tar acids, the worse it was for fish; but tar acids were easily taken out. Why should some people wish the tar acid limit to be left as it was, or removed altogether, simply because they did not desire to eliminate the tar acids?

Mr. V. ESCOTT WOOD (Works Manager, Vulcan Iron-Works) said that in his district the surveyor, by using small quantities of bitumen mixed with coal tar, had produced good surfaces, which lasted a long time; and that was the important point, having regard to the large sums of money now being spent on roads. A good deal had been said about free carbon in tar; but he would like a definition of what was meant when free carbon was spoken of. Was it free carbon as such, because if so it could not have any binding power whatever? He much doubted whether there was a very large percentage of free carbon in tars—except possibly the high-temperature tars produced in coke ovens—and certainly not what could be called atomic carbon.

Mr. F. M. POTTER (Products Works, Gas Light and Coke Company) referred to the doctoring of low-viscosity tars by adding pitch or bitumen to bring their consistency within the required range, and said that all who had had experience of the manufacture of tars would agree that this was very bad practice. Speaking with experience, not only in the laboratory, but on actual trial sections of roads laid down at Beckton, he said it had been found that there was a definite range only within which it was advisable to add bitumen to tar, and this range varied with the nature of the original tar. For instance, in the case of some horizontal tars, the amount of bitumen added should not exceed 10 p.ct.; otherwise there was a definite reduction in the lasting properties of the surface. Again, there was a tendency among authors and speakers to take some of the properties independently, rather than the various items in the specification as a whole, and judge in this way, in the laboratory, the cementation and durability properties of the tar. Mr. Barash had given the percentage of topping required with vertical retorts, and also some analyses of vertical retort tar which seemed to show exceptionally high free carbon figures for a vertical retort tar. It would be interesting to know whether the original tar was exceptional, or whether some cracking had occurred in the distillation.

THE ELECTRODE INDUSTRY.

Mr. G. B. BROOK (Chief Chemist, British Aluminium Company) put in a plea for an industry which was rather an exceptional one in relation to the conference—viz., the manufacture of electrodes. The transition from the horizontal to the vertical retort system was a serious problem for the electrode industry, because it was impossible to make carbons of the same quality from vertical retort coke as from horizontal retort coke. It was important in the manufacture of electrodes that the free carbon should be in the nature of elemental carbon in suspension acting as a binder between the grains. A point of great importance was what were termed in the carbon electrode industry synthetic mixtures of tar and pitch. They looked with very grave fears on those who provided these mixtures of tar and pitch made from too-far-distilled tars. The electrodes were made with 18 or 20 p.ct. of tar as a binder, or tar and pitch. The process of manufacture was to grind the coke, and calcine the whole material at a temperature of 1200° to 1300° C. in a reducing atmosphere.

NEED FOR CO ORDINATION.

Dr. E. W. SMITH suggested that the requirements of the electrode industry could be met by making arrangements with a particular gas-works to supply what was necessary. There was a works in this country which had been continuously—except during the past month, due to the strike—putting oils into vertical retorts, and completely cracking these oils. He could not see that any difficulty should arise, where a special material was required. It should be brought definitely to the notice of the public that the amount of coal carbonized nowadays in different types of vertical retort was well over 50 p.ct. of the total coal carbonized in the gas industry. Vertical retort tar had come to stay; and the tar industry had been, and was, adapting itself to the new type of tar. It would be realized that, from the economic point of view, it did not pay to spend much money in elaborate methods of carbonizing in order to supply a product which represented only a small financial return to the gas undertakings. It would be valuable if there was more co-ordination between the tar distilling interests—as distinct from the tar distillers—and the gas industry. There were tar rings and combinations which were all to the good for the gas industry; but was it not possible to go further? It was obviously bad business for medium and small works to transport tar distances varying from 5 to 20 miles, which tar contained 20 p.ct. of water, and for the prepared tar to be returned another 20 miles. The tar could readily be treated satisfactorily,

under proper supervision, on the gas-works itself. It would be better for the tar distillers to take a really broad view of this matter, and say to the gas undertakings that an arrangement between the undertaking and the distiller to supervise—if there was no proper supervision—the working of the gas undertaking still, would be to their mutual benefit. It was said that the small works have not the necessary technical knowledge available Therefore, if the tar distiller came in in an advisory capacity in this way, and helped the gas industry by supervision, it would mean that the tar would be produced in a proper way under more economical conditions.

THE AUTHORS.

The authors, who will give their full replies in writing, contented themselves with brief statements at the conference.

Mr. ADAM said that Mr. Potter had brought out a very important point, when he suggested that the specification should be taken as a whole, and not criticized upon certain details only, as if these alone affected the final result. With regard to specific gravity, which had been mentioned several times, many gas-works to-day were making about half their output of carburetted water gas; and in doing so they were producing what was known as an oil gas tar. There was great danger that this oil gas tar, which was a petroleum body, would be put into the other tar, and go along to the distiller. It was generally agreed that oil gas tar had no binding properties; and if it got into the tar used for road purposes, it would have very bad results. Free carbon content could be taken as an indication of the origin of the tar. Several speakers had mentioned a difficulty in understanding what was meant by free carbon. The accepted test for free carbon was to treat the tar with benzole in a soxhlet extractor. The material which was insoluble in nineties benzole was stated as the free carbon. That was not pure carbon by any means. It contained roughly about 30 p.ct. of volatile matter—possibly gummy bodies which in themselves had distinct binding power. If the free carbon obtained in that way was extracted with pyridine, the gummy bodies were dissolved out. The free elemental carbon, however, had no binding power, and could be regarded only as a diluent. It had been suggested that it was profitable to extract the tar acids; and for this reason he could not see why such serious objection was being taken by the makers of tar high in tar acids to their removal. Undoubtedly tar acids—and especially low boiling tar acids—had a serious effect on fish and vegetable life in rivers.

Mr. BARASH, referring to specific gravity, said he was still not satisfied with the explanation given for fixing a minimum. It appeared to be with the object of eliminating the addition of exceptional amounts of free carbon, or inert matter which showed in the analysis as free carbon; but from the point of view of ruling-out tars, for instance, below 1·15 sp. gr.—which would not be considered satisfactory for road purposes—he did not think the proposal would be entirely successful. It would rule-out tars containing the paraffins, for example, which, although having a low specific gravity, possessed binding properties better than those of tars with a higher specific gravity. On the question of free carbon, he had remarked in the paper that the use of the term was unfortunate, and had pointed out the anomaly that a deficiency of free carbon, under the Tar Distillers' Specification submitted to the Ministry of Transport in 1922, could be rectified by an addition of impalpable powder of mineral origin, provided the powder was thoroughly and uniformly incorporated in the tar while hot. He certainly would not advise adjusting the viscosity by the addition of pitch or of an oil.

Mr. HOLLINGS stated that the high-temperature readings mentioned in his paper were taken by optical pyrometers.

Dr. PARKER, also speaking on the question of free carbon, said that, if by this was understood atomic carbon, he doubted whether it existed at all in the so-called free carbon at present, or whether it existed in coke. He did not suppose atomic carbon was obtained in any of the processes. What were obtained were complex substances containing a high percentage of carbon, and probably oxygen, hydrogen, and other substances. The points that had been brought forward with regard to the free carbon content of tar for road purposes were important, because as 50 p.ct. of the coal carbonized by the gas industry was in vertical retorts, and special provision had to be made for tar from Scotch coals, the specification proposed would possibly only apply to one-half of the tars produced.

EVENING SESSION.

Mr. T. F. E. RHEAD (Birmingham Gas Department) emphasized the desirability of co-ordination and standardization of the various methods. There was, for example, the question of the sampling of tar. This was not an easy matter, and it was one which he commended to the Committee to be formed, because the need for careful sampling was very important. Again, the size of sample for evaluating these tars in the laboratory must not be too small, otherwise it would be difficult to get anything really representative of the large bulk. A fairly large laboratory still was necessary, of the type of the Parker, which had been mentioned. This type had been in use in Birmingham for some time. It was not by any means the last word in laboratory stills, but it enabled 2 gallons of tar to be dealt with. The great difficulty in distilling tars to the thermometer was with the superheating vapours. In many tars there was (say) 5 p.ct. of water; and this came to the top, because in top heating frothing was eliminated. This, however, brought with it the trouble of superheating the vapours, and a false reading on the thermometer. These were points for the proposed Committee to deal with.

Dr. W. B. DAVIDSON pointed to the necessity for having an additional test—a road maker's test, what might be called an agglomerating or agglutinating or even conglomerating test—something after the style of the Gray or the Moritz test for coke.

Mr. C. P. FINN (Manvers Main Collieries) remarked that the specific gravity of the tar produced in narrow ovens was higher than vertical retort tar or ordinary coke oven tar. How far was it considered that this high specific gravity was influenced by the narrow oven, and how far by the method of recovery of the tar? The paper gave no information as to the method of recovery, and it was possible that the tar was produced as the result of a series of fractional condensations, by which the lighter oils had been eliminated by means of a direct recovery process. Another striking feature about this tar was the high tensile strength—viz., 171 lbs. per sq.in. Did this give the pitch any increased value, or did it make it specially valuable for some particular purposes?

Mr. S. A. WIKNER (Newcastle) said that the more he heard of vertical tars, the more thankful he was that he did not have to distil them. When he was at Birmingham they had a 50-50 mixture; and it must not be thought he was anti-vertical. In that case they were using Dessau vertical retorts. At Newcastle he had 25 p.ct. of vertical retort tar and the remainder horizontal retort tar; and he regarded vertical tar as being valuable when used in this way. There had been no real trouble with it. The tar was clean and thin, and it contained some valuable products easy to distil. In particular, it left a clean still; and he had always been glad to have a proportion of it. This was all he could say definitely about the advantages. Throughout the whole range of products, however, there were things which caused worry, some small and some large, mainly because the products were different from those which buyers had been accustomed to from the early days, when all tar was horizontal. For instance, the benzole was low in gravity, though that did not hurt it as a motor spirit. The naphthas were low in gravity; and with the small proportion of vertical tar used in Newcastle, they found that many markets were entirely closed to them because of the low naphtha and paraffins. Despite the fact that he could sell all the heavy naphthas he could make, it was disconcerting and undignified to be unable to sell as good a product as the other fellow. Carbolic was generally all right, but it was low in quantity. Cresylic was obtained in good quantities; and there were valuable tar acids; but trouble had been experienced through colouring. This did not worry him very much, because he did not sell for the purpose of making disinfectants. The whole of his tar acids could be made into sixties carbolic and cresylic which conformed with the American specification. The colour would not remain pale, but there was no trouble in disposing of the tar acids. With regard to emulsions, Scotland seemed to have had serious trouble; and this difficulty was by no means solved. Low-temperature cresylic must be similar; and in the lifetime of many of those present the country would be flooded with low-temperature tars. It had been stated that the cresylic portion did not seem to crack-up into anything very valuable. There would be a large quantity of tar acids to be disposed of; and some means must be found of treating these tar acids so that they would make a white emulsion. Otherwise the buyers would have to change the specification. The authors had not referred to one point regarding creosote, which was a rather serious one—viz., the low specific gravity. With his own small percentage of vertical tar, he was unable to turn out creosote which would conform to some of the American specifications. There was trouble in some works through the creosote getting very light in colour. In some instances in his works, where the creosote was stored under water, it almost appeared as if the water and the creosote had changed places during the night; and it was difficult to know where the water was. Nobody attempted to make anthracene from vertical tar. It had been made in Newcastle when anthracene was a good market; but it had been found that the natural product contained in paraffin, when dealing with a small amount of vertical tar, had the effect of making the anthracene difficult to refine. The crystal was different in character; and his 25 p.ct. of vertical tar gave an enormous amount of trouble in this respect. He was pleased when the anthracene market went down, and he did not have to make it any more. With regard to pitch, vertical retort pitch had been under suspicion for a long time; and his own suspicions had been confirmed by the paper, because they now heard of some pitch being returned after distillation. It was evident that horizontal tar and pitch in briquettes showed a tremendous increase in strength over others. The Newcastle Company had a good reputation for tar; and he had been assured by those using it that other tars were no good, because they would not stick on the stones used for road making. Tar that would not stick to the stones had been traced as being vertical retort tar, which was unfortunate. Vertical retort tar producers and distillers had such a large revenue that they could well afford to take a little less for their pitch.

BLOWN PITCHES.

Mr. H. J. HAILSTONE (Rochdale Gas-Works) said he had hoped to hear something about blown tar products. In the States they had, for many years, treated petroleum and bitumen by blowing them, to increase the wearing properties and toughness; and might not that be applicable to some tar products? It should increase the binding properties of the pitch or road tar. For instance, ordinary pitch heated in a still and blown with air rapidly increased in free carbon. Exactly what was the result he did not know, but it was quite easy to demonstrate that fact. The pitch from the tar became viscous, and the free carbon content went up rapidly. Nobody seemed to have done any definite work in this connection. His personal view was that, when a tar was exposed on the road, it was slightly oxidized, with an increase in free carbon; and this might have some bearing on the wearing properties of a tarred road. As regards pink emulsions, it was rather an important fact that 1d. more per gallon could be obtained for a creosote which would give a white emulsion. It seemed to be purely a question of combination; and there was no published information he knew of on the subject, showing that the pink emulsion was lower in bacteriacidal value. If this were so, something might be done, in the way of advertising and publicity, to convince users that pink emulsions were better for them. Some years ago he tried some experiments with sheep dips, to see if the pink would dye the wool, and got negative results. Therefore he was at a loss to understand why the prejudice against the pink colour existed.

Dr. E. W. SMITH said that two years ago a couple of big distillers were in correspondence with him about the pitch being produced from vertical retort tar, and large samples were sent for examination. He was at a loss to understand why there should be a difference in the values of the pitches for briquetting; but in both cases heavy consignments had been returned from the Continent. He made up 1 cwt. samples of four different pitches, from vertical retorts, horizontal retorts, coke ovens, and Mond gas plant, and these were sent to a large briquetting works. The request was made that the pitches should be used in the normal process of manufacture, and that the same percentages should be employed as were found by experience at that particular works to be most suitable. The briquettes were tested in a practical way by the briquette maker, who reported that there was little to choose between them, but that pitch "B" was certainly the best. Pitch "B" happened to be from a vertical retort. Different methods of working vertical retorts gave different results. In the system he knew most about, it was usual to work the high temperatures at the top of the retort; and therefore they got a much bigger proportion of those tars that normally came from horizontal retorts. It was advisable that there should not be too much generalization as to what were the qualities of tars from different systems of vertical retorts. Different results could be obtained, depending entirely on how the retorts were run.

Mr. F. M. POTTER asked Mr. Macleod what method he had adopted for determining the free carbon for road tar purposes. It was clear that the so-called free carbon was dependent upon the insoluble matter; but with pitch the method of determining the free carbon content was of far greater importance. In the case of coal tar it would be found that the original free carbon was not altered very much by the ordinary distillation processes; but in regard to pitch there was a definite increase, depending to some extent on the distillation process. Some work on this had been done at Beckton; and there might be an opportunity of publishing it later.

Mr. WYNTER BLYTH (Newton Chambers & Co.), speaking of the various strengths of soda used for the extraction of tar acids, said he was extremely doubtful whether they were tar acids at all. As a disinfectant manufacturer, he never accepted as a tar acid one that was soluble in three times its volume of carbonate of soda. It was time they made up their minds what they were going to designate tar acids. There were often disputes in regard to high-boiling acids, concerning the boiling-points; and unless some standard method of distillation was adopted, these disputes would continue.

REPLIES.

Brief replies were again given by the authors; the full statements being reserved.

Mr. MACLEOD, replying to Mr. Finn with regard to the narrow oven, said Mr. Finn had answered his own question. It was the fact that the high specific gravity of the tar from the narrow oven was due to the high heats. These ovens were made of Consett silica; and the temperature in them was between 1300° and 1400° C. The secondary vapours from the coal in the oven came in contact with the high heat above the charge, and underwent degradation; and this involved a high specific gravity and a high carbon content. The distillation, of course, was very rapid. About fourteen hours was sufficient to distil a charge of coal.

Mr. CHAPMAN, referring to the question of tensile strength, said that neat vertical retort pitch admittedly had a lower tensile strength than other forms of pitch. Indeed, the values were found to be so low that it was better to mix some dust with the pitch. Actually, whinstone dust was used. Mr. Taylor's paper had also brought out that point. Mr. Taylor had mixed a standard sand; but he would find it better to use a much finer material, because the finer the material, the greater the effect. With precipitated chalk, for instance, it was possible to get a tensile strength of 500 or 600 lbs. per sq.in. The matter of the proportion of benzole, naphthas, and tar acids was of great concern to those working in Scotland. Benzole at the moment was the most valuable constituent. The heavy naphtha contained 13 p.ct. of paraffins, and was useless for many purposes. A strange point was that in Glasgow they could not dissolve their own pitch in their own naphtha. It settled-out after standing for about twelve hours. It was also admitted that the specific gravity of the creosote in Glasgow was low. It might occasion some surprise to hear that the bulk creosote had a gravity of only 970. Consequently, the water was at the bottom of the tank, which was an advantage compared with horizontal tar distillation. As to the binding power of tar, the Glasgow Department had a test consisting of two plates 2 in. sq. A film of tar was placed between the plates, and pressed by a definite weight at ordinary temperatures. A chain passing over a pulley pulled the two plates apart; and in that way a measure of the binding power was obtained. Horizontal tar tested in the same way showed a slight increase amounting to about 5 p.ct.; and it was thought that this formed a definite binding test. The binding power of pitch was totally different. Tar acids were claimed to reduce its binding power, and it had been stated that it was possible to reduce the tar acids down to the new specification. If that were done, however, there would not be sufficient oil left to let back the tar; and it would not be possible to destroy the oiliness of the pitch. Air blowing increased the free carbon markedly, and doubled the viscosity.

Mr. WILSON said that the tar acids from the McLaurin low-temperature process were infinitely worse as regards colour than those from vertical retorts. While the problem of getting the right colour had not been solved at the Provan Works, it was possible to produce an emulsion there which complied with a very stringent specification from the United States, requiring that the emulsion when made should remain white for five hours. The emulsion was prepared from potash soap made from castor oil. The untreated acids would not remain white for five minutes; and the problem in Scotland was much worse than that which vertical retort people in England had to face. As to the difficulty of Glasgow in getting rid of its huge supplies of tar acids, the fact was that the department were 20,000 gallons behind in deliveries to customers.

CORNISH ASSOCIATION OF GAS MANAGERS.

At a meeting of the Cornish Association of Gas Managers, held at Truro on Nov. 24, a presentation was made to the Hon. Secretary (Mr. F. G. Kingwell, of Falmouth) in appreciation of the additional services rendered by him in connection with the purchase and allocation of foreign coal for the Cornish works.

Mr. F. R. G. Grant, of St. Ives, the President, in making the presentation, said that the collective purchase of imported coal had been of great assistance to members, and a deal of work other than that of an honorary nature had been thrown upon the Secretary.

Mr. Kingwell, in acknowledgment, said that between 5000 and 6000 tons of coal had been distributed, which in some cases enabled smaller works to carry on when otherwise they would have ceased to supply gas.

Electrically Welded Gasholders.—Following a paper which he read at the 1923 convention of the Canadian Gas Association, Mr. Joseph N. Reeson (Engineer-in-Chief to the Metropolitan Gas Company of Melbourne) presented a paper to the Institution of Civil Engineers on "The Influence of Electric Welding in the Design and Fabrication of Plant and Structures." In the earlier paper he described some gasholder welding work which had been carried out by the process of the Quasi-Arc Company, Ltd., of 15, Grosvenor Gardens, London, S.W.; and in his contribution to the Institution of Civil Engineers, he gave details of further gasholder welding. He mentioned four holders that had been constructed at his Company's works by electric welding; the last being a 1 million c.ft. holder at the Fitzroy station. In the issue of "The Engineer," dated Nov. 26, this holder is described, and illustrated by photographs. The greatest departure from present-day practice in the case of this holder is in the guide framing, which consists of twelve bays of standards and bracing, and five tiers of horizontal struts. The standards and struts are built of steel tubes; and the whole is so welded as to form a very stiff structure. The standards are 145 ft. in length, 18 in. in diameter in the lower three tiers, and 15 in. in diameter in the two upper tiers. The struts are 15 in. in diameter in the three lower tiers, and 12 in. in diameter in the two upper tiers. The metal is ¾ in. thick throughout.

Illumination Research.

The Department of Scientific and Industrial Research have published Illumination Research Technical Papers Nos. 1, 2, and 3. No. 1 (price 9d. net) deals with the terminology of illumination and vision; No. 2 (price 6d. net) with the transmission factor of commercial window glasses; and No. 3 (price 1s. net) with the light distribution from an industrial reflector fitting. These papers are obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2.

A Guide to German Plant Manufacturers.

We have received from the publishers, Mundus Verlagsanstalt G.m.b.H., Berlin, Charlottenburg 4, Schlüterstr. 52, a copy of a book entitled "Handbuch der Gas-Industrie" (Handbook of the Gas Industry). It contains full particulars of the addresses and business details of a large number of firms in Germany which manufacture gas plant. These are classified primarily under the branches in which they specialize—general plant, chamber ovens, producers, &c.—but they are also listed alphabetically. Full details are included of the various associations which enter into the organization of the German gas industry, with particulars of their officers, membership, and aims. The present volume is No. 3 of a series dealing with the main German technical industries. It is priced at Mks. 15, bound in cloth.

Trichromatic Colorimeter for Standardization Work.—A reprint of a paper by Mr. J. Guild, A.R.C.Sc., &c., read before the Optical Society on Jan. 21, has been forwarded to us by the author. This paper describes a trichromatic colorimeter designed and constructed in 1922. The instrument is suitable for standardization work, as it may be employed to obtain the specification of any colour whatever in a form which may be converted if desired to any fundamental basis of specification. The three working primaries of the instrument are obtained by means of filters. The mixing of the primary colours is effected by a periscopic prism which rotates past three stationary sectors. Provision is made for adding any of the primaries to the colour under test, where this may be necessary in order to obtain a match. In this way colours of higher saturation than it is possible to match directly may be dealt with.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Practical Paper on Gas Appliances.

At this meeting Mr. F. S. Larkin, of the Gas Light and Coke Company, dealt with the improvements which have been made in late years in gas cooking and heating appliances. Many points of current interest were discussed, including the advantages and disadvantages of drilled-ring and spreading-flame burners, and of one-burner and two-burner gas-ovens. An extensive range of exhibits demonstrating the progress of gas cooking and heating apparatus added to the value of the paper.

A meeting of the Association was held at the Westminster Technical Institute on Friday, Nov. 26, when a paper by Mr. F. S. Larkin was followed with the greatest interest by an exceptionally large gathering of members, and evoked an excellent discussion.

At the outset, Mr. ARTHUR BROADBENT, the President, referred to the receipt of two communications. One of these was from Mr. Walter Hole, the Organizing Secretary of the Institution Education Scheme, in which he explained the delay in publishing the results of the recent examination; and the other was from the Western Junior Gas Association, thanking the London Juniors for their good wishes. Mr. Broadbent remarked that their lecturer that evening required no introduction. He was an old member of the Association, and well known to them all. He had unique opportunities of dealing with the question of improvements in, and adaptations of, gas apparatus; and his paper would doubtless result in a helpful discussion, as did a paper which Mr. Larkin read before the Association during the year prior to the war.

RECENT ALTERATIONS AND IMPROVEMENTS IN GAS COOKING AND HEATING STOVES.

By FRED S. LARKIN, A.M.I.Mech.E., Local Manager of the Fulham Stove and Meter Works, Gas Light and Coke Company.

[Extract.]

GAS FIRES.

In the manner of distributing the heat, great improvements have been made in gas fires. Gone are the old heated castings on which dust and dirt could burn and smell. The bulk of the heat is radiant, though it is an open question whether low-temperature convection has not much to recommend it if the temperature of the castings is not allowed to get too high. As an example of this construction, the Parkinson "Conrad" fire with its special air heating chambers is a good one. I am sure you have your own opinions on these and other points; and it will be interesting to have an exchange of views on these matters.

Some firms make a special point of what is termed an "injector-ventilator," which is claimed to help greatly in causing a more frequent change of air in the room; while other firms refuse to acknowledge that it does, and rely on their special form of canopy to do all that is necessary.

VENTILATION.

What is the limit of satisfactory ventilation? Is it not possible to have too much of a good thing? Is it necessary to disturb such a large volume of air in the space in which a person is sitting? Would it not be better to encourage the principle of the Nautilus flue, and inside that provide a casing which would carry the products just above the ceiling level, and then, by means of a ventilating brick let into the flue, make the products do the work of an ejector ventilator, and assist in the removal of the foul air from the higher level.

With fires, we have the inset type which is self-contained and can be placed in the ordinary coal grate. The latest type of this, by Sugg, is concave instead of convex or flat, which the makers claim is far better than the latter forms if the chimney is at all doubtful. Fires of the grate type such as the Wilson "Sunbeam" or Main's "Cinderella" leave little to be desired in comfort and elegance.

If the grate and inset types of fire are satisfactory from a ventilating point of view—and from all reports they are—is there any advantage in moving a larger volume of air by means of the injector-ventilator?

The adjustable flue outlet which, in its present form, had its birth at Fulham, seems to be popular now. It can move through 90° in adjustment, as against 60° in the older type—and without leaving a pocket under the canopy, which caused eddies in the flow of the products. In the case of the Gas Light and Coke Company its adoption has resulted in stocking only five different flue sleeves, instead of nearly sixty varying flue elbows; and the number of "specials" now made is almost down to zero.

As far as renovation work, with which I am primarily interested, is concerned, what a benefit it has been to have the various parts so thoroughly standardized. With the interchangeability and ease of adjustment which now exist, the cost of renovation is far less than it used to be, while the ease of regulation of the injector on the district must have been the salvation of many a fitter's reputation in the rush season.

RADIATORS.

Here progress has been made, but perhaps in a way not so pronounced as with the fire. A few years ago it seemed that the principle of the steam radiator—the condenser—showing a fire, and the smaller ones using an argand or a similar burner, had come to stay; but recently the pendulum has been swung the other way by our scientific friends, and we are told that convection heating of the future will be better if we do without the fire and condensation; and give up the idea of using steam as a medium.

While we are employing an apparatus which is 100 p.ct. efficient, it certainly seems unnecessary to introduce the medium of water if an equal distribution of heat can be obtained without it.

[At this stage Mr. Larkin showed a modern "St. David" radiator, in which, by the introduction of the well-known Wright's rod thermostat, the temperature can be regulated to the heat required. In the "St. Bernard" radiator, explained the author, thermostatic control is not attempted; but a governor is introduced which keeps the consumption within the necessary bounds.]

For the last two seasons we have been using the "Belle" radiator, which has the advantage of being capable of being built up in one, two, or three column units, and is a non-condenser of the argand flame variety. This is an efficient heater; and the absence of the necessity of the consumer having frequently to get rid of the water of condensation is a big advantage. You will at once recognize that these three examples are the natural sequence to the old Davis steamless radiator and Fletcher "Floral" model, which, in their day, were very satisfactory. Slight alteration in design and control of the volume of gas consumed make all the difference when in use on the district.

Whether we shall be successful in weaning the public from the old Wright's "B.777" condenser, the Wilson "oo Brighton," or similar stoves remains to be seen. With its massive construction and cheerful fire, it is possible that the demand for this type for well-ventilated premises will still continue.

As an intermediate step, in the Gas Light and Coke Company, we have gradually evolved what you might call an up-to-date B.777 and oo Brighton non-condenser, and have retained the comfortable fire effect. The objection from the scientific point of view, of course, still exists.

We have converted a large number of these from our old stock of condensers; and should the demand continue, it may be that new ones will have to be constructed on similar lines. Progress, if sound, is generally slow; and this apparatus is, I think, one of the best examples I can give you as regards the number of small alterations which have been made to make an appliance what it is to-day. When I first knew it about eighteen years ago, it had the old ball fuel, and had no gas or air regulator; and though only designed to act as a condenser up to 16 or 17 c.ft. per hour, it was frequently found consuming as much as 30 to 35 c.ft. per hour, and was then, of course, found fault with by the consumer, on the grounds of smell.

THE "BALANCE" RADIATOR.

The advent of the motor car brought with it the need for warming garages in the cold weather; and gas appliance manufacturers were not slow to recognize that this was a new field for exploration.

With the liability of petrol fumes to ignite, however, the subject had to be approached carefully; and in the earlier forms of garage heater the principle of the Davy safety lamp was employed to reduce the risk of explosion to a minimum. This form has, however, given way to one in which the air for combustion is taken from the outside, and the products are conveyed outside as well—somewhat on the principle of the "Southampton" geyser. This is known as the Davis "Balance" radiator.

In a paper of this description, it is impossible to deal with each piece of apparatus in which great strides have been made; a few examples only being used to emphasize the point.

WATER HEATERS.

Water heaters, whether of the geyser, circulator, or boiler type, have come in for their share of attention; the improvements among this class of appliance being more in the direction of ease of cleaning and assembling rather than in

efficiency, which has always been of a somewhat high order. Special note might be made of Sugg's "Marlborough" wash-boiler, with its dished top to reduce the risk of boiling over and rusting, the enamel coming right over the rolled edge, giving a fine finish; also the Cannon "Corna" type is very useful when the position is a corner.

Coke boilers have come to stay. The more recent ones, which provide a cheerful fire and extensive hob with the continual supply of hot water at a slight cost, leave little to be desired.

Water heating, without a doubt, is one of the many fields in which we shall be able to reap a good harvest, whether the medium be gas or coke—the choice depending on the circumstances and wishes of the consumer, combined with the results required.

An Appreciation.

I feel that I cannot leave the subject of water heating without paying a tribute to one who has been a real pioneer in that work. I refer to the late Mr. Potterton. Many of us, I am sure, can remember with pleasure the advantage we have derived from a chat on this subject with him. His genial personality was never more pronounced than when he was telling of troubles he had met, and how they were finally overcome. It must have been a pleasure to him in his declining years to see how well his sons carried on his good work.

Cookers.

Here again notable progress has been made, but it is only during the last few years that what we can really call satisfactory appliances have been within the reach of all.

I do not know who the gentleman was who first designed the hotplate of the well-known "Bungalow" cooker, but I always look on the "Bungalow" bar as being one of those improvements which are a jump forward, as against the gradual process through which these advances are normally made.

Considering that, generally speaking, 75 to 80 p.ct. of the gas used on a cooker is consumed on the hotplate, efficiency here is of the utmost importance; and I am glad to think that I was able to call attention to this fact in a paper which I had the pleasure of reading before you on Nov. 28, 1913. At that time I was making a large number of experiments to determine the absorption and conduction of heat by the bars and cornice, together with the most efficient pitch and angle of drilling of the holes in the burner; and I well remember one bar from a cooker just removed from the district with which appliance just double the amount of gas was required to boil a quart of water in an 8-in. vessel as that with one of the then more recent design.

I cannot help feeling that, though good progress has been made in fires, radiators, boilers, and coppers, the ultimate financial gain to the consumer has been far greater on the cooker hotplate than in any of the others.

I think that I can safely say that, with any modern cooker, an efficiency of about 50 p.ct. with an 8-in. vessel can easily be obtained on one of the burners; larger burners being provided where the more rapid heating of larger vessels is required, and where time is an even greater factor than efficiency.

Hotplate Burners.

The type of hotplate burner which gives the greatest satisfaction to the consumer is evidently not yet unanimously agreed upon, and diverse views are expressed with regard to the supremacy of the spreading-flame burner over the drilled ring type or *vice versa*. When, a few years ago, the Continental, or spreading-flame, burner was improved, and introduced as the only burner which was really efficient, cheap and crude forms of it were soon made, and sold through ironmongers' shops, with the claim that they would save half the gas bill. The novelty appealed to the public; and the makers soon found a demand for this type of burner in their hotplates. Since then, however, some have reverted to the drilled-ring burner as being the better for all-round domestic work.

Those responsible for the design of the Standard cooker of the National Gas Council were convinced, after many experiments, that the "20/30 drilling," as it is known, and which was determined by our experiments at Fulham in 1913, was satisfactory; and they have had up to the present no reason to doubt the wisdom of this decision, though the design was so arranged that, should the spreading-flame burner be so improved as to be demonstratively better for general purposes than the ring burner, the change-over could be made without any alteration of standard parts. Alterations have been made in the spreading-flame burner since the first appearance; the orifices being gradually increased in number from three or four to sixteen in some cases, and in others more still. It may in time be hard to distinguish between this type and those radially drilled burners on some of the older cookers, which were supposed to be for simmering purposes, except that the actual drilled orifice has given place to ports formed by placing a flat casting over one in which serrations or ports have been cast, and the mixture is under good regulation.

The argument advanced by the makers in favour of the spreading-flame burner is that it gives a higher efficiency and cannot be extinguished by liquids boiling over. On the other hand, the makers supplying the 20/30 drilled burner claim that the boiling-over bogey is much exaggerated, and that just as high an efficiency can be obtained at a given rate of consumption; while for simmering, the small jets of flame being about 1-in. below the vessel allow the heat to be equally distributed over the bottom of the vessel, and consequently the risk of burning is much less than in the case of the spreading-flame burner, which, as you turn it down, concentrates the heat close under the middle of the vessel. Naturally, in such circumstances, the efficiency of the latter is higher, but this is the point where general utility must be considered.

Hotplate Bars.

With regard to bars, we have here to weigh in the balance efficiency and utility; and it may be that, in some of the makes of bar, utility has been too much sacrificed to efficiency. At one time it was almost a craze to see that not a particle of iron which could be dispensed with was in contact with the vessel, thereby saving absorption and conduction of heat. True, it was the ideal to aim at, provided the tendency of small vessels to topple over was not increased and the cleaning cloth did not get caught up in some of the projections. Experience has taught us that in this respect again we must keep utility to the front, even if 1 or 2 p.ct. of efficiency is lost. At the end of a week's cooking, this loss would not be felt; and the housewife is far more satisfied with a bar she considers more suitable.

Enamelled Steel.

Owing to the public demand for the smart appearance and cleanliness of enamelled steel, this material has largely come into favour in the last few years. It has much to recommend it for sale and hire-purchase where the consumer is really interested in taking care of a nice-looking article which is, or will become, her own property. From the point of view of hire, however, I am sure that a cast-iron exterior, with the exception of perhaps a door panel, gives the most satisfactory results.

Enamelled steel is difficult for this purpose, and will remain so until we can get an enamel at a fair price which will not chip, can be slightly bent if necessary, can be gripped by a screw without flying, and will stand a high temperature without crazing. In the Gas Light and Coke Company we issue on hire no gas cooker with an enamelled steel body; our experience in dealing with those returned from hire-purchase being enough to convince us that, if they were issued for general hire, 90 to 95 p.ct. would require new external enamels if they were to be sent out again up to the high standard which our Company have decided must be maintained for hire.

Bottom Flue Outlets.

How often are our alterations and improvements the resurrection and modernizing of principles which were tried many years ago, and which for some reason or other were allowed to fall into disuse. In glancing through a list of new inventions at a certain exhibition recently, I was struck with the number of old ideas which had been once again the subject of application to the Patent Office—some slight alteration being necessary, of course, for the granting of a fresh patent.

This applies to the principle of removing the products of combustion from the top or the bottom of the oven. The advocates of the "bottom" method are at present split up into two camps. In the first place we have the Radiation "New World" cooker with its direct flue outlet at the bottom and a single burner at the back of the oven. This single burner, it is claimed, has the advantage of being able to be reduced to a lower consumption than can two burners, if such low temperatures are required, with less danger of being blown out by draughts or door-slamming. This form has, of course, necessitated a new series of cookers.

Secondly, we have the "Conservor" oven of Messrs. Main, in which the existing two burners are retained; the back lining and crown packing being the only departure from "Maintenance" standard. In this case the products, taken away at the bottom of the oven, pass up between the back lining and back casting. It is claimed that this method makes use of the principle of regeneration, and thereby the highest efficiency is obtained. As this arrangement can be applied to any of the "Maintenance" cookers, there is no need for a new series and its resulting spare parts.

It depends, of course, on the amount of gas used in the oven whether it is economical to spend an extra amount of money in increasing the efficiency. Many are of the opinion that, as in the ordinary way only about 20 p.ct. of the total gas used on the cooker is consumed in the oven, if the alteration for control is going to cost much more, then it is better left alone. Of course, there are many houses in which the oven is in frequent use; and in such cases the expense is justified.

There are two ways of increasing efficiency. Either restrict the excess of secondary air by means of what may, I think, be described as automatic thermostat control, by the hot products in the oven refusing the admission of an excess of air, or by means of a damper on a normal flue outlet controlled by the oven cock in such a manner that, when the gas is full on the flue outlet is wide open, and that as the gas is turned down to the cooking position, the damper is gradually closed to keep the excess secondary air in the safe proportion. When the gas is shut off, the damper, which is in the form of a butterfly, is closed except for the necessary clearance between two castings. The latter was the method adopted for the National Gas Council Standard cooker, and appears to be giving general satisfaction in use.

It may be said, therefore, that the results are obtained in the "New World" and the "Conservor" by scientific, and in the Standard by mechanical, means.

I do not suggest that either method is really new, for both are improvements on practices in use many years ago. You may remember that the old "Hygienic" cooker had the damper controlled from the oven cock by a series of levers, while the old "Giles" cooker had a bottom flue outlet.

In this case the burners were not in the oven itself; and the products of combustion, after passing through a form of grid, to retain as much heat as possible, passed over the crown and then down the back to the outlet.

The makers of the bottom-outlet cooker claim—and I think it is generally agreed—that the oven is heated more evenly by this method. Now the question is this. Though it may be ideal for bread baking, and in all cases where the oven is being used for baking or roasting foods requiring the same temperature, is it ideal for the housewife who wants to cook (say) a joint and milk pudding at the same time, or any other foods where different temperatures are required? Though the makers of the "New World" cooker do not issue it in the ordinary way, we have found it necessary to arrange for them to supply a dividing shelf—which is practically the browning shelf of the ordinary cooker—in all those we send out on hire. Consumers have become so accustomed to the browning or dividing sheet that they do not care to be without it; but these ovens are not under thermostatic control.

The value of thermostatic control is, of course, governed by the question whether even or uneven heating of the oven is desired. If the former, then it is a decided advantage, but if the latter, the browning or dividing sheet prevents it acting as it should.

Enamel linings, which in the past have caused us considerable trouble owing to their liability to craze and crack, and in some cases to flake off the iron in large pieces, are now more satisfactory, and will stand in a far better manner the frequent expansion and contraction to which they are exposed.

Replacing Appliances.

The Directors of the Gas Light and Coke Company have adopted a liberal policy in the matter of scrapping inefficient apparatus; and there is no doubt that the Company and the industry generally will ultimately reap the benefit of this progressive action. During the last three years, up to the end of September, at Haggerston and at Fulham nearly 100,000 have been scrapped; and in their place have gone out apparatus which is in every way up-to-date. In addition, there were certain appliances which, owing to their value and construction, lent themselves to conversions which brought them up-to-date; and of these we have dealt with over 100,000, making a total of about 200,000 altogether. Naturally, the replacing of such large numbers of inefficient appliances with efficient ones cannot be effected without, at any rate temporarily, a loss of revenue in the shape of a reduction of gas consumed; but we have the satisfaction of knowing that the consumer is obtaining our best form of service. I do not think we should be far out if we took an all-round increased efficiency of 10 p.ct. as the accrued benefit to the consumer by this scrapping policy. In the end it is bound to promote the still further increased use of gas appliances, for satisfaction to the consumer is the best advertisement we can have.

The present coal shortage has been responsible for a large demand for gas appliances; and it may interest you to know that during a recent fortnight we delivered no less than 15,000 cookers, fires, radiators, &c., to the district.

Discussion.

Mr. E. C. Holt (Gas Light and Coke Company) expressed his appreciation of the paper. The author had given them the benefit of his wide experience, and had shown what progress had been made in gas apparatus during the past few years.

Old-Type Condensing Stoves.

Mr. D. J. Winslow (Lea Bridge) referred to the old type of condensing stove. Recently a consumer had asked to have one fixed. On being urged to have some other appliance more satisfactory for his purpose, he had replied that one of the large London stores sold them. The fact that large stores stocked apparatus which were not approved by the gas companies was, said Mr. Winslow, a decided nuisance. Mr. Larkin had converted the condensing stoves to the non-condensing type. Was it not preferable to condense the water vapour? When it was not condensed in the stove, it often condensed on windows and walls, which was objectionable. He was favourably impressed by the new hotplate bar which Mr. Larkin had demonstrated. The type of bar designed for high thermal efficiency was difficult to clean; there were too many corners and projections. Moreover, small utensils were apt to overturn when placed on these bars. He thought the manufacturers had not yet produced an absolutely satisfactory enamel lining. Too often the enamel was apt to chip-off, a fact which naturally resulted in consumers' dissatisfaction. Regarding water heating by gas, could Mr. Larkin tell them of a good but inexpensive gas water heater suitable for small houses? He would also like to hear from the author further views regarding the relative advantages and disadvantages of the one-burner and the two-burner oven. There was a practical drawback with the one-burner oven in that a taper was required to ignite the gas. Regarding drilled and drip-proof burners, he had experienced difficulty with the former type due to burning-out of the necks of the burners, which were thinly cast. He had noticed a growing preference by the consumer for the inset pattern of fire. He thought that this type might eventually supplant the ordinary gas fire.

Mr. J. R. Gale (North Middlesex) asked if the efficiency of the externally-heated oven was as high as that of the internally-heated type.

Radiant and Convected Heat.

Mr. F. C. Smith (Gas Light and Coke Company) said that he was interested in the question of radiant *versus* convected heat. In the laboratories at Watson House they were making experiments with a new type of gas fire designed to increase the amount of convected heat. [Reference to this fire was made in an account of the opening ceremony of Watson House—see "Journal" for Nov. 24, p. 489.] If they could increase this convection, said Mr. Smith, it would be a move in the right direction. Two or three years ago he carried out some research work on the corrosion of wrought iron and steel. He found that no rusting took place when these materials were in an atmosphere of dry carbon dioxide and dry oxygen. When, however, water vapour was introduced, corrosion occurred rapidly. Thus, in a condensing stove of the type mentioned by Mr. Larkin and Mr. Winslow, the conditions were really ideal for corrosion, for all these three agents were present. As for condensation of water vapour on windows and walls, Mr. Smith suggested that if this took place, then the stove was fitted in a wrong position—perhaps in a room which was not freely ventilated, and where there was no proper air movement.

Drilled-Ring and Continental Burners.

Mr. J. G. Clark had hoped to be present at the meeting, and to speak on the subject of drilled-ring *versus* Continental burners. Mr. Smith said that he could not tell them what Mr. Clark would have said, but he would like to comment on the question. He had taken both types of burner, and had tested their efficiencies—*i.e.*, the number of B.Th.U. required to raise a definite quantity of water through a certain range of temperature—with pressures varying from 10 to 60 tenths. He had plotted the B.Th.U. required against the time taken, and had obtained a characteristic curve for the flame-spreading burner. A drilled-ring burner had then been constructed—by varying the three dimensions which influenced the results (the distance of the ring from the kettle, the angle of drilling, and the diameter of the burner head)—which gave a curve indicating an efficiency equal to that of the Continental burner.

The "Injector-Ventilator."

Mr. W. L. Westbrook was of opinion that, in gas fire design, they had relied too much on radiant heat, and had paid too little attention to convection. It was necessary in many cases—in sick rooms, for instance—to raise the temperature of the air; and this could not be done by radiant heat. He would like to know whether Mr. Larkin considered the injector-ventilator device necessary. Was the arrangement actually an injector, or did it depend for its action on the pull of the chimney flue? He thought that, from the gas distributor's point of view, it was a pity the manufacturers claimed so much for the injector-ventilator. He agreed with the author that they should have ventilation at ceiling level. He was interested in the concave gas fire. On first sight it might be thought that the effective field of radiation was narrowed by the shape of the fire, and that this would restrict the distribution of heat into the room. However true this might be theoretically, the new fire was unquestionably efficient in practice. What was the author's opinion of the "Balance" radiator? To his (the speaker's) mind, it was an excellent appliance, and, if thoroughly successful, might solve the problem of heating the flueless room, unless it was possible for an eddy current to blow down one of the ports, and thus extinguish the flame. With regard to gas wash-boilers, did the Gas Light and Coke Company advocate the fixing of a flue in every case. He considered this advisable. Then there was the question of drilled-ring and spreading-flame burners. Respecting this, he thought that neither burner could claim superiority; each had its merits. With the drilled-ring type, it was necessary to adjust carefully the distance between the ring and the appliance; and when this was fixed for a particular pressure of gas, variation in this pressure affected the efficiency of the burner. This factor did not enter into consideration with the Continental burner, but, on the other hand, this type required more careful adjustment. For example, if the regulation was such as to give a hard flame, there was a tendency for this flame to be extinguished easily. The time factor was, of course, of great importance from the housewife's point of view. He suggested that a hotplate efficiency of 50 p.ct. was low, and capable of improvement. Perhaps if some of the newer patterns of kettle were more extensively employed, this figure would be raised. Hotplate bars should be as plain as possible; and he thought that the new type fitted on "Radiation" cookers was excellent. Mr. Westbrook concluded his remarks by asking if

it was easy to adjust the oven burner of a "New World" cooker fitted in a recess. Accessibility was a necessary feature.

PACKED AND UNPACKED COOKERS.

Mr. W. R. MOGER (Tottenham) asked whether Mr. Larkin had tested the relative efficiencies of packed and unpacked cookers. He had heard that in some cases the unpacked type did more work. Experience of the "rose" burner had shaken his faith in this pattern.

Mr. V. C. W. ROBERTS (Hornsey) said that he had come to the conclusion that an improved form of drilled-ring burner would supplant those of the rose type. As for enamels, these were not yet perfect. Consumers who had bought stoves on the hire-purchase system had complained, after a period varying from one to two years, of flaking of the enamel lining. It was a serious matter if flakes of enamel fell into the food being cooked. He asked the author whether, with the new type of cooker with restricted flue outlet, he had experienced trouble from "smothering," due to faulty adjustment of the oven burners by outside fitters.

The PRESIDENT asked Mr. Larkin whether he had tested the American "star" burner.

Mr. F. HOLLAND (North Middlesex) mentioned a spreading-flame burner with sixteen holes as being more satisfactory than one with only three flames.

THE AUTHOR'S REPLY.

Mr. LARKIN, replying to the discussion, said that it was a pity that some of the big stores in London stocked gas apparatus which was not approved by the gas undertakings. Only lately he had come across two or three cases where a stores had sold to consumers appliances which certainly would not have been sanctioned by the Gas Light and Coke Company. Mr. Smith had supplied the answer to the query about corrosion in connection with the "B777" type of condensing stove. As for Mr. Winslow's remark about condensation on windows and walls, this was all a question of the relative humidity of the air, and the outside temperature; and the degree of humidity of the air in an apartment depended, of course, on the ventilation. Mr. Winslow had also mentioned the toppling-over of utensils on cooker hotplates. Small vessels should not be used, because they were inefficient. No vessel having a diameter less than 5 in. should be employed; and he personally would have nothing under about 6 in. The ideal size was 8 in.; and most of their tests were carried out with vessels of this diameter. At one time they had had considerable trouble with enamel chipping during transport; and it was found that the outside enamel had to bear the weight of the hotplate. This was remedied, with beneficial results. Enamels of the mottled kind were best, for when the grip and the surface were continuous there was greater liability to cracking. Mr. Winslow had asked him whether he could recommend an inexpensive gas water heater suitable for small houses. All he could say on this point was that it was useless to buy flimsy apparatus, which soon wore out and in the long run caused dissatisfaction. They should recommend only appliances which would stand up against long service; and this type naturally cost more than the flimsy apparatus.

ONE-BURNER AND TWO-BURNER OVENS.

His opinion had also been asked on the merits or otherwise of one-burner and two-burner ovens. Well, when high authorities in cooker construction could not agree on this point, how could he give a satisfactory answer? [Laughter.] Provided that the sum of the orifice areas of the one burner equalled the sum of the orifice areas of the two burners, he could not see why the two-burner oven should be unsatisfactory. Attention had been drawn to the burning-out of burner necks. This was no doubt because too much gas was passing through the burner. When this was the case, there was often a downward spreading of the flame, due to the fact that there was insufficient secondary air to burn the gas efficiently. With proper regulation of the gas, a ring burner should last as long as the cooker itself. With regard to the efficiencies of externally and internally heated ovens, he would put the former type at 25 p.ct. and the latter at 40 p.ct. He agreed with Mr. Smith's remarks on drilled-ring and Continental burners. Mr. Smith had shown that it was possible to design a drilled-ring burner which would give all the efficiency of the spreading-flame type. They knew by experience that the point could not be decided only on the basis of thermal efficiency; there were other practical considerations. It was, said Mr. Larkin, satisfactory that tests were being made to increase the amount of convection from the gas fire. Mr. Westbrook had inquired about the injector-ventilator device. At the level of a gas fire canopy, the air of a room was pure; and it certainly seemed foolish to pass this cool fresh air up the chimney. To his (the speaker's) mind, the ejection of air from a room should take place at ceiling level. In this way they would get rid of the foul air, which was precisely what they wanted to do.

SUGG'S CONCAVE FIRE.

The radiation from Sugg's new concave fire was very good. Apparently the makers had tried a number of radii, and after experimenting had discovered the correct curvature. He thought that the "Balance" radiator, for which he had high hopes, would have to be well tried out on the district before it was installed in a living room. As to wash-coppers, the Gas Light and Coke Company always fitted flues. On the question of packed *versus* unpacked ovens, the advantage was decidedly in favour of the packed type, though it did take longer to heat up. It was necessary to see that in the packed cooker all joints were properly sealed, especially those under the crown. The "star" burner had been tried. He did not think it had any outstanding advantages, and to his mind the ring burner was more efficient and more flexible.

A vote of thanks to Mr. Larkin terminated the meeting.

BRITISH COMMERCIAL GAS ASSOCIATION.

A National Conference on Inspection and Maintenance.

A meeting of the General Committee was held on Wednesday, Nov. 17. Through the courtesy of the Governor of the Gas Light and Coke Company, the meeting took place at the Company's new showrooms in Church Street, Kensington; and those present much appreciated the opportunity thus afforded of inspecting the showrooms.

In the absence of the President, Sir H. Russell Bencraft, M.R.C.S., the Immediate Past-President, Mr. JOHN E. COWEN, J.P., took the chair.

The Association's Editor and Consultant, Mrs. M. A. Cloudesley Brereton, and the Manager, Mr. W. M. Mason, were absent from the meeting owing to illness; and messages of sympathy to both officers were directed to be sent.

Resolutions of deep sympathy with Mr. C. F. Blincoe (Middlesbrough) in his recent bereavement, and with the family of the late Mr. Templer Depree, were passed.

SALES OF PUBLICITY MATERIAL.

This report contained an interesting record of business done with members in connection with the supply of publicity material for distribution locally. A feature of the past three months' work has been the extraordinary growth in the number of overseas members making use of this material.

COMMERCIAL ORGANIZATION SERVICE.

The amount and variety of the work being done on behalf of subscribers by the Commercial Organization Section was set out in a detailed statement as an appendix to the report. Steps are being taken to bring this work more prominently to the notice of members.

PUBLICITY.

A recommendation from the Executive that the Association's publicity campaign in the national and district Press should be resumed, as to the use of gas for industrial purposes in January next, and as to cooking and water heating in the middle of February, was approved.

GAS *v.* ELECTRICITY DOMESTIC COOKING TESTS.

After further consideration, the Committee unanimously decided to adhere to their previous decision—namely, that the object of these tests was, primarily, for the information of the industry as to the exact position, and that the results should not be circulated in printed form to the public, as so doing might give rise to the erroneous impression that the industry was seriously concerned with the competition of electricity for cooking, and would give unwarranted publicity to that competition.

INSPECTION AND MAINTENANCE OF CONSUMERS' APPLIANCES.

Further consideration of this important question led to an animated discussion and the bringing forward of many points of interest.

In view (1) of the short time available for the discussion at the Annual Conference at Newcastle of the papers on this subject, presented by Mr. H. H. Creasey and Mr. J. W. McLusky; (2) of the fact that Mr. W. J. Sandeman was, unfortunately, prevented from presenting his paper at that conference; and (3) of the great importance of arousing the whole industry to the urgency of the problem, it was decided, on the proposition of the Chairman of the Executive, that a National Conference on Service and Maintenance should be convened of the whole industry, and held in London on Wednesday, Feb. 16, 1927. It was decided that the Institution of Gas Engineers should be invited to co-operate, in order that the engineering side of the question might be fully considered, as efficient maintenance of appliances is of little use unless backed by an adequate supply of gas. It was felt that such a meeting would provide a much needed opportunity for the fuller discussion of many points on which gas managers who have not yet adopted any scheme are desirous of obtaining information, as well as an interchange of views and experience of those who have.

Institution of Chemical Engineers.—A conference will be held at the Science Museum, South Kensington, S.W. 7, on Wednesday, Thursday, and Friday, Dec. 8, 9, and 10.

Export of Pitch.—The Board of Trade have issued an Order revoking the Pitch (Emergency: Prohibition of Export) Order, 1926. In consequence, the exportation of pitch from the United Kingdom is now no longer subject to licence.

MIDLAND JUNIOR GAS ASSOCIATION.

A well-attended meeting of the Association in Birmingham on Thursday, Nov. 18, was presided over by Mr. C. F. TOOBY, who, referring to the lecture to be delivered, remarked that the Stanton Company were the pioneers in this country of centrifugal pipe casting. He then called upon Mr. P. H. Wilson, an abstract of whose lecture (which was accompanied by a number of lantern slides) follows.

PRINCIPLES OF CENTRIFUGAL CASTING AS APPLIED TO THE MANUFACTURE OF SPUN IRON PIPES.

By P. H. WILSON, M.Inst.Mech.E., Foundry General Manager to the Stanton Ironworks Company, Ltd., near Nottingham.

[Extracts.]

The adaptation of the principles of centrifugal force to the manufacture of cast-iron pipes was accomplished through the unremitting labour, experiments, and tests of a French engineer, M. D. Sensaud de Lavaud. His process dispenses with the necessity of utilizing sand and loam cores, and permits the introduction of labour-saving devices, at the same time considerably improving the conditions under which the workers can operate.

At the Stanton Ironworks, the raw materials—pig iron, scrap, coke, and limestone—are, after being systematically analyzed, discharged from wagons on an elevated railway into ferro-concrete bunkers; the various grades of pig iron being placed in respective bunkers according to the silicon content. Travelling beneath the bunkers are electrically-operated 2-ton travelling carriages, upon which are fitted weighing machines. Skips are placed on these carriages, and can be put into position under any particular bunker. The loaded skip, having been withdrawn from the bunker carriage by electric haulage gear, is raised by hydraulically operated hoists to the top of the cupola, into which the contents are automatically discharged through bottom doors. The cupolas have a melting capacity of 10 to 15 tons per hour; and the molten metal is tapped into 3-ton casting ladles, which are conveyed to the casting shop by means of a 5-ton electric crane on a telpher runway.

CASTING.

The pipe is formed in an accurately machined cylindrical steel mould, the inner dimensions of which coincide with the outer dimensions of the finished pipe, including the enlarged formation of the socket end. The mould is revolved on its own axis by means of an impulse water turbine inside a water-cooled iron casing. This revolving mould is supported at two points in its length by two sets of friction rollers which have bearings on the inside of the casing, and are lubricated by grease cups accessible from the outside. The casing, with its revolving mould, is caused to traverse backwards and forwards on its bedplate by means of a hydraulic cylinder beneath the casing. Through the annular space between the cylinder and the casing the cooling water is circulated; being kept at a constant temperature and pressure. A tilting ladle and a cantilever trough supply the metal to the revolving mould.

The only core used is that which is necessary to shape the inside of the socket. The bedplate of the machine slopes slightly away from the tilting ladle, so as to give the metal, during casting, the requisite fall, and ensure uniform thickness of metal in the pipe. The casing containing the mould is moved up towards the tilting ladle; the cantilever trough projecting into the interior of the mould towards the socket end. The pelton wheel is started; and when the mould has acquired the proper speed, the tilting ladle discharges the molten iron down the cantilever trough. When the socket portion of the mould is filled with metal, the casing is traversed away from the tilting ladle at a definite speed, which assures the molten metal lining the mould evenly throughout its entire length. When the mould reaches its extreme position, it is clear of the end of the spout, and any excess of metal in the trough is discharged into a receptacle at the side of the machine. The rate of tilting the ladle, the peripheral speed of the mould, and the traverse of the machine, are all in a constant ratio for any particular size and thickness of pipe. The molten metal solidifies in a few seconds; and when contraction has taken place, the pipe is withdrawn.

Owing to the rapid cooling of the pipe in the water-cooled mould, the outer skin is slightly chilled; and it is necessary to heat-treat the pipe in order to normalize this structure. For this purpose, it is passed straight from the casting machine to a gas heated annealing furnace.

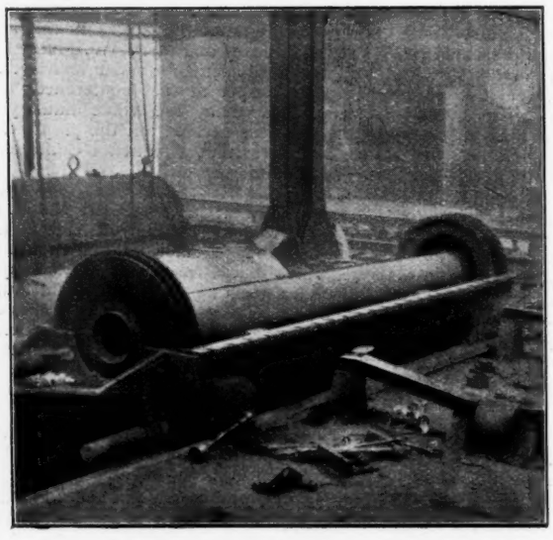
The next process is mechanical cleaning and internal scrubbing, after which come the dipping tanks, where the pipe is coated with Dr. Angus Smith's mixture. Reaching the hydraulic testing pumps, each pipe is tested to double its working pressure.

A comparison between the sand cast method and the new method in regard to labour time shows that, whereas by the old method 20 men and boys produce 54 pipes for a day's work, 7 men and boys produce 180 pipes of a similar size in the same time by the centrifugal process. These figures equal 3 pipes per man per day by the old method, and 25⅔ pipes per man per day by the new. On account of the increased strength of the spun metal, it is possible to effect a saving of 25 p.ct. in the weight of the pipe.

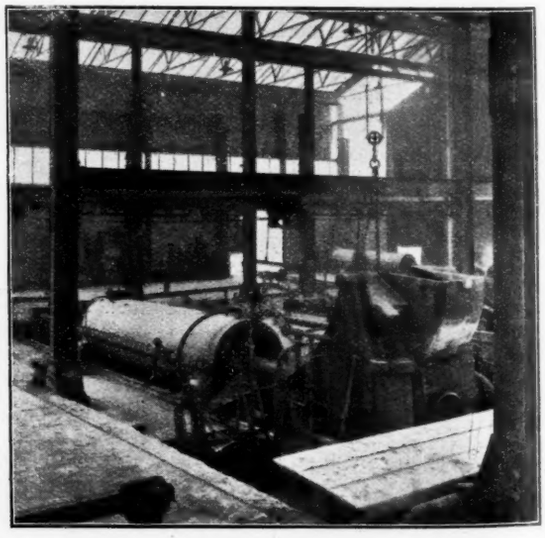
The speed of rotation of the mould is an important factor in the satisfactory production of centrifugal castings; and the optimum speed is known for each size of pipe cast. The process itself consists of the deposition of a continuous spiral of metal inside the rotating cylindrical mould; and it is clear, therefore, that to produce castings of uniform section the metal must flow at a constant rate. This is achieved by the special design of the tilting ladle. Other important factors involved in the introduction of metal into the mould are the rate of delivery from the pouring spout, and the angle at which this delivery takes place. The ideal direction of flow of the metal leaving the spout would be when the tangent to the mould at the point where the metal touches it for the first time coincided with the tangent to the parabolic curve described by the metal. This, in practice, is impossible; but the spout-end has been so designed, and is placed in the mould in such a position, as to make the angle between the two tangents very small. The synchronizing of the rate of tilting the metal, the speed of the traverse of the machine, and the peripheral speed of the mould, are highly important factors.

Numerous tests have been carried out to ascertain the physical effect on pipes cast at different temperatures; and the best results obtained with Stanton iron are with a temperature lying between 1220° and 1250° C.

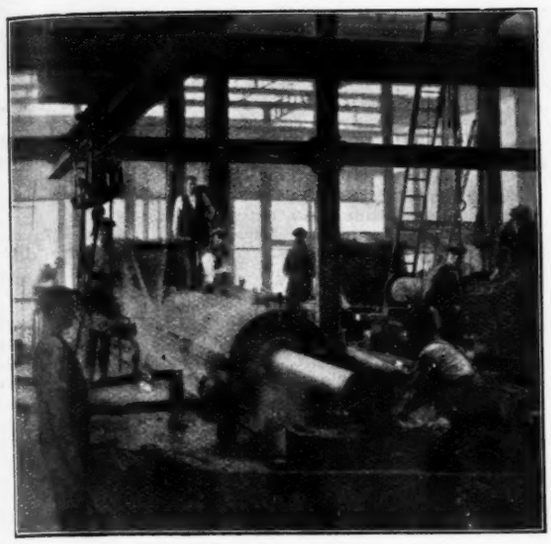
Very definite segregation occurs in metal cast centrifugally. Thus, to ensure freedom from excessive migration of the elements, the metal needs to possess as short a cooling range as



Cylindrical Steel Mould.



Casting Machine.



Withdrawal of Pipe.

possible. The ideal composition is therefore an eutectic melt. The pig iron and scrap are carefully graded in the bunkers according to analysis. Further, the silicon content in the re-melted metal is determined every hour from each cupola, which enables absolute control of the metal composition to be secured.

It has frequently been suggested that the chill formed on this type of casting (to which reference has already been made) is harmful. It is agreed that chill itself is not desired, being hard and brittle; but when completely normalized, it possesses extremely good mechanical properties, which do much to improve the quality of the pipe. Annealing or normalizing, as practised, does not affect to any extent the middle and inner sections of the pipes. The enhanced properties of spun metal can be ascribed to the structural features obtained by the rate of cooling in conjunction with centrifugal force, producing a fine deposition of the graphite and distribution of the phosphorous, as well as a general reduction of grain size.

Hydraulic Pressure Test.

The object of this test was primarily to determine the ultimate bursting pressure of pipes of varying size and thickness; and the results were:

Spun Pipes.

Dia. of Pipe. In.	Average Thickness. In.	Bursting Pressure, Lbs. per Sq. In. 12 Ft. Length.	Average Thickness. In.	Bursting Pressure, Lbs. per Sq. In. 5 Ft. Length.	Calculated Tensile Strength. Tons per Sq. In.	
					12 Ft. Length.	5 Ft. Length.
6 . .	0·367	2800	0·351	3200	12·75	14·51
8 . .	0·354	2500	0·398	2850	13·3	14·41
10 . .	0·427	2250	0·444	2650	13·58	14·45
12 . .	0·442	2000	0·448	2300	13·46	14·65

No results are available for the 4 in. pipes, as the bursting pressure of these is higher than that obtainable by the pump and tackle used—namely, 6500 lbs. per sq. in. For comparison with the above table, figures are given obtained from similar tests on 5 ft. lengths of sand cast pipes:

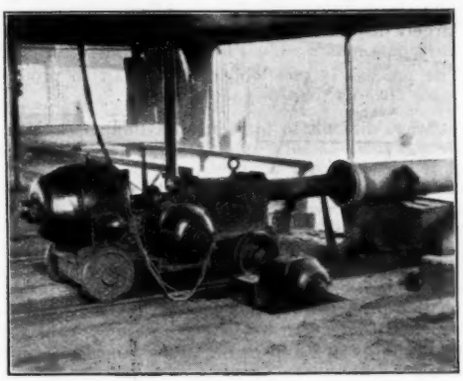
Sand Cast Pipes.

Dia. of Pipe. In.	Thickness. In.	Bursting Pressure. Lbs. per Sq. In.	Calculated Tensile Strength. Tons per Sq. In.
6	0·424	2050	6·94
8	0·481	2200	8·87
10	0·507	2050	9·58
12	0·545	1550	8·04

The figures for the short lengths are consistently higher than those for the full length pipes; this being due to the greater bending effect on the longer pipes, owing to end pressure exerted by the bolts in testing. From the above figures it will be seen that the strength of the spun pipes was on an average 74 p.ct. more than that of the sand cast pipes. The average calculated tensile strength was 14·5 tons per sq. in. for spun pipes 5 ft. long, compared with 8·36 tons per sq. in. for sand cast pipes. These figures appear low; but this is due to combined stresses set up in the pipes by the method of testing adopted.

External Pressure Test (Line Load).

In order to obtain a measure of the resistance of the pipes to external loads—such as heavy vehicular traffic and trench filling—a press was prepared, consisting of four hydraulic cylinders suspended from a crosspiece; and sections 24 in. and 12 in. in length, cut from different portions of each of the pipes, were tested in this machine. The point of the first fracture was observed; this occurring at the top or at the bottom of the pipe, these being the points at which the maximum stress takes place. The average results were as follows:



Electric Scrubber.

Dia. of Pipe. In.	Thickness. In.	Load per Foot. Tons.
4	0·383	8·56
6	0·379	6·72
8	0·394	5·47
10	0·442	5·78
12	0·441	4·46

Tensile Tests.

Tensile test pieces were cut from all pipes on which experiments were made; and the average results of 170 tests are given below:

Dia. of Pipe. In.	Tensile Strength. Tons per Sq. In.	
	Spun.	Sand Cast.
4	19·98	10·58
6	19·10	10·71
8	18·43	11·00
10	18·05	11·65
12	18·00	10·90
Average . . .	18·71	10·37

The British standard specification for cast-iron pipes calls for a tensile test of 9½ tons per sq. in.

Conclusion.

The characteristics of the spun iron are so outstanding that it can only be a question of time before the process replaces older methods. From a commercial point of view, perhaps the greatest obstacle to the adoption of the centrifugal method of making iron pipes is the fact that, unless they are produced on an extensive scale, and unless manufacturing operations are continuous, day and night, full advantage is not being taken of low manufacturing costs. It follows that the process will only be adopted by those concerns, and in those countries, where an extensive demand is assured.

The advantages of the spun pipe may be summarized as follows:

1.—The resulting pipes are stronger, and can consequently be made thinner than the ordinary sand cast pipes. The latter are purposely made thicker than the actual requirements demand, to allow for irregularities in moulding and possibilities of flaws in the metal.

2.—The resulting pipes can be relied upon as being uniform one with the other, independent of the skill of the manual labour employed. The need in the case of the process of making spun pipes lies in the direction of maintaining the machinery in good condition; and this is easier than keeping at concert pitch the varying factors associated with every-day labour.

3.—The fact cannot be overlooked that the ordinary methods of making iron pipes necessitate employment of labour under conditions far from congenial; and there is no disguising the fact that during recent years there has been a difficulty in getting apprentices to follow in the footsteps of their fathers. Not unnaturally youths of the coming generation drop into works where the conditions are as amenable as possible. Thus a process which

largely dispenses with the disagreeable conditions of ordinary pipe making must have its advantages.

4.—The process is one which cannot fail to produce pipes more cheaply than present methods.

It is always difficult to introduce anything new into so conservative a country as England. The fact, therefore, that up to the end of July last over 2034 miles of these pipes had already been made and supplied, must be regarded as satisfactory; and that of these, 1665 miles, or 81 p.ct., represent repeat orders, speaks for itself. The plant laid down at Stanton for making these pipes is turning out some 25 miles weekly, in sizes varying from 4 in. to 15 in. in diameter. There is no reason to believe that pipes of larger diameter could not be equally well made by this process; but the demand for the larger sizes of pipe is a good deal more erratic, and it is doubtful whether a plant would be justified unless it was kept in fairly continuous operation.

Discussion.

The PRESIDENT warmly congratulated Mr. Wilson upon his informative lecture, which he said would be of real value to the members, especially in view of the fact that a visit was shortly to be paid by the Association to the Stanton Works. It would appear that the Company had shown commendable enterprise in carrying the process to a successful issue. Improved working conditions, lower labour costs, and increased strength were important factors.

Mr. H. R. HEMS (Senior Vice-President), moving a vote of thanks to Mr. Wilson, said his Company had devoted years of research to the development of the process. He would like to know how the temperature of the metal at the ladle was taken. He agreed that an important point was the accuracy in centrifugal pipe, and commented with satisfaction upon the modern tendency among manufacturers to improve working conditions in the casting shops.

Mr. A. KENDRICK seconded, and stated that absence of diameter variations was as essential as uniformity of thickness.

Mr. F. K. HAWTHORN (Saltley) inquired if the chilled surface of the pipe was any detriment. Was it possible effectively to lead-line the pipe?

Mr. S. N. SIMMONS pointed out that no difficulty was experienced in coating the pipes with lead.

Mr. WILSON explained that the temperature of metal could be accurately taken by optical pyrometers. These were supplied as a check; but the experience of the workmen could generally be relied upon. There was a distinct saving to the consumer in sand-cast pipes. As to the question of identification, it would be very difficult to cast marks on the face of the socket. The precise reason for the increased strength of the pipe was not heat treatment; it was due to the splitting-up of the phosphorous and graphitic carbons, and therefore to the resulting density of the metals. Another factor to the same end was a quick rate of cooling. Numerous tests with regard to corrosion had been made; and the results were slightly better than with ordinary cast iron. The chilled surface was in no way detrimental. Flanged pipes could be made by the process; but the cost would be extremely heavy. There was no difficulty in lining pipes with molten lead; and the lead adhered perfectly. Concrete was being largely used for lining pipes for water purposes, to check incrustation. If there were not quick cooling, the desired higher strength of the metal would not be obtained. The reduction in weight was achieved by the elimination of the defects associated with sand-cast pipe, and to the greater strength due to the density of the metal.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A meeting of the Yorkshire Junior Gas Association was held on Nov. 20 at Sheffield. It was President's day, and nearly seventy members of the Association met at the Sheffield Gas Company's Workshops, Shude Hill, at the invitation of the Directors and Mr. Ralph Halkett, the General Manager and Secretary of the Company. They were met by Mr. S. T. S. Musgrove (the new President of the Association), Mr. A. Wylie (Sales and Fittings Superintendent), Mr. Ralph Halkett, Junr., and other officials of the Company. Among the visitors was Mr. J. Wilkinson, of Nottingham, the President of the Institution of Gas Engineers.

Proceeding on a tour of inspection of the furnace rooms, the members saw various types of appliances used for work peculiar to the Sheffield trades. Experimental and research work is carried out here; and the numerous applications of gas to industrial purposes were explained by members of the staff. In the new workshops the visitors were impressed by the orderly way in which the stores are received and despatched. The cooker repair shop on the top floor of the three-storey building proved an attraction.

The visitors then proceeded to the Grimesthorpe Gas-Works, where various members on the manufacturing side of the Company acted as guides.

Thereafter tea was taken at the invitation of the Directors of the Sheffield Gas Company.

Mr. C. H. CHESTER (Wakefield), Senior Vice-President of the Association, took the chair after tea. He said how pleased they were to have Mr. Halkett with them.

Mr. HALKETT, who was enthusiastically received, welcomed the Association to Sheffield. They had inspected the new workshops. Owing to the growth of their business, provision of new shops had been necessary. Like other gas undertakings, they were looking ahead. In spite of keen competition, they were showing an increase in the output of gas and of fittings—and not alone on the heating side. Mr. Halkett said he was astonished at the number of lighting fittings, amounting to many thousands, which had been sent out recently. It was no uncommon thing for orders to be taken on some days for hundreds at the showrooms. This proved that gas lighting was still very much alive; and he (Mr. Halkett) was of the opinion that even in face of competitors, if the question of gas lighting was properly tackled, the industry would retain a large portion of the lighting load, and also receive new orders. Regarding the furnace department, Mr. Halkett said that this was helpful to Sheffield in solving the problems with which various undertakings in that city had to deal. Special operations were carried out, and the Gas Company were ever on the alert to help their consumers. Up to the present they had not received a proposition with which they could not deal. The experimental shops for furnaces were used for building furnaces to suit the particular requirements of individual customers. They could bring customers there, and show actual work in progress. This gave confidence and guaranteed satisfaction. Regarding the manufacturing side, their horizontal retort house was the largest in the country, having 575 retorts. Commenting on the coal stoppage, Mr. Halkett said that all in the gas industry were glad that a termination of the deadlock was now being effected. They would look back over the past six months with a feeling of pride in what they had done. He contended that they should bring before the public a statement of what the gas industry had accomplished. He had heard Sir Arthur Duckham say, a little while ago, that the amount of capital sunk in coal alone by the various gas undertakings of the country at the commencement of the stoppage amounted to over £10,000,000. The gas concerns did not increase the price of their product until it was absolutely necessary; and he considered that this should be brought to the notice of the public. Again, 4 or 5 million tons of coke had been available; and it was difficult to estimate the true value of this.

Mr. WILKINSON, who is an hon. member of the Association, said that it was 27 years since he left a small Yorkshire gas-works to take control of the Grimesthorpe Works. He urged upon those present the need for studying every process from the retort house to the consumers' houses.

The CHAIRMAN then called upon Mr. Musgrove to give his presidential address.

PRESIDENTIAL ADDRESS

of Mr. S. T. S. MUSGROVE, of Sheffield.

Being engaged on the distribution side of the undertaking I serve, I propose to confine my remarks to that section, in the hope that those members who are more particularly connected with the manufacturing side may not find them entirely uninteresting.

If any of you at any time are inclined to think that your daily work is circumscribed, and does not offer that opportunity which you feel you deserve, I would ask you to stop and consider the amazing progress our industry has made during the first quarter of the century in which we are living, or in the somewhat shorter period that this Association has been in existence. Even for those of us who were engaged in the industry as far back as 1900 it is somewhat difficult to visualize the position of the average distribution department in those days. I do not think it would be far from the truth to say that the district department then consisted almost entirely of mains, services, and meters; and through these our product, gas, was "supplied." The appliances to be obtained for lighting, cooking, or heating were crude, and limited in number and variety; and the consumer had to find out for himself how to use them. Contrast this condition of affairs with our present position, and I do not think you will differ from me when I assert that no other industry in the country has made more rapid progress than that to which we belong. This is equally as true of the small undertaking in the country town or village as it is of the larger concerns which serve our cities and boroughs. It may be interesting, as well as instructive, to try to analyze the methods and means which have been employed to achieve such success. Probably the natural increase in the population of the country would account for a proportionate increase in the output of gas; but the development of the distribution side of the gas industry must be attributed to other causes. I think these may be summarized somewhat as follows: Organization, improvement of appliances, service,

advertising, smoke abatement, and the increased utility of gas as a factor in labour saving.

ORGANIZATION.

However much undertakings may differ in their methods, we all have the same object in view—viz., to carry out the work entrusted to us in such a way as to inspire the consumer with confidence and trust that the goods recommended and fixed do actually perform in a satisfactory manner the duty for which they are installed, and thus lead to an increased use of our product. The realization that it was not sufficient to carry the gas to the outlet of the meter was, I think, the reason which led to the extension of the distribution department and its rapid development.

The production of cast-iron pipes and the method of laying them is one of the few things that has not materially changed during the period under review. Many methods for jointing the pipes have been tried; but it appears that the run lead joint properly caulked is still the most popular type to-day. It was formerly the custom to have these pipes coated both inside and outside; but as the use of water gas became general, it was found that the oily constituents acted as a solvent, and caused the coating in its dissolved state to exude at the base of the joints and result in leakage. Most cast-iron pipes now used for conveying town gas are therefore not coated inside. Steel tubes, where the soil is suitable, have some advantages in first cost, in rapidity of laying, in transport, &c.; but opinion is divided as to the relative life of steel as compared with cast iron where the soil is of the "made-up" variety. Undoubtedly, the life of a steel tube depends largely on the coating or wrapping around the exterior; and I venture to suggest that there is room for considerable improvement in this direction. Service pipes are still of lead, wrought iron, or steel; but, owing to the heavy cost of the first named, wrought iron and steel are at present receiving most attention. Wrought iron, however, appears to be the popular choice.

IMPROVEMENT OF APPLIANCES.

In considering appliances, full credit must be given to the manufacturers for the continuous improvement which has been made in the design, finish, utility, appearance, and efficiency in use of the many forms of apparatus for lighting, cooking, heating, or any other purpose. This is frequently brought to the notice of the district man when he is called in to advise the consumer as to the best means of obtaining certain results, and he comes up against some form of appliance which was installed in years gone by and needs replacing. It is at such times we realize the progress that has been made in the construction and use of gas appliances.

Not that I wish to infer that perfection has been reached. I feel we are justified in expecting further improvement as a result of the work constantly being carried out in the well-equipped laboratories which now form a part of most manufacturers' establishments, as well as of some of the larger gas undertakings. In this connection I venture to think that the gas fire has received most attention, and shows most convincingly the rapid strides that have been made.

SERVICE.

The present-day attitude of the gas undertaking official contrasts favourably with the somewhat authoritative manner which was far too prevalent at the beginning of this century. While the rules and regulations of supply remain approximately the same, there is certainly a great improvement in the manner in which they are interpreted.

It has now been rightly realized that, although we may be officials of the undertakings by whom we are employed, we are also servants of the public, to supply whose needs it is, and always should be, our privilege. It is certainly true that "sweet reasonableness" has been, and still is, an important factor in creating and preserving that favourable opinion which is so desirable to the continued use of gas. While it is fully realized that certain "conditions of supply" are necessary to the successful conduct of an undertaking's business, on the interpretation of those conditions by those of us who come in constant contact with the consumer depends to a large extent the measure of success which we attain. A study of the "conditions of supply" of several undertakings shows that there are two somewhat different policies in force to-day—first, what may be described as an inclusive charge for gas, which covers the cost of service and meter and the fixing of certain appliances and some form of maintenance; and, secondly, a price for gas which is kept as low as is possible, and a charge made for the means of supply and the fixing and maintenance of all appliances.

The local circumstances obtaining in any particular city or town, and the nature of the load—whether it is purely domestic or partly domestic and partly industrial—must be carefully considered in this connection; but I feel that, whatever the circumstances may be, the time has come when some scheme of maintenance is essential in order that the increasing number of appliances found on any district may be periodically examined by competent men from the gas undertaking, and any necessary cleaning or adjustment done. Only by some such method is it possible to ensure that appliances are used on every occasion with satisfactory results. Whether a charge is made for this work of periodic maintenance, or whether it should be included in the price charged for gas, in which case it is usually described as "free" maintenance, is purely a matter of policy.

The use of gas certainly does result in products of combustion; and these products, in their passage from the point of ignition to their ultimate destination, come in contact with surroundings of different kinds, and in most cases form a deposit which needs removal. If this is neglected, the efficiency of the appliance rapidly decreases, and ultimately leads to that appliance being put out of use. This is particularly noticeable in those appliances which are used for water-heating. It is therefore not surprising to find that this question of maintenance has become of paramount importance in every progressive undertaking. It has often occurred to me, when examining the effects of the products of combustion from (say) a water heater in constant use, that it should be possible for our chemists or research students to devise some form of condenser or filter to deal with the constituents of the products of combustion, and thereby render them less harmful than is sometimes the case. While making this suggestion, I am aware that the study of the products of combustion is receiving the attention of the research chemists at the University of Leeds. The report recently published on this subject was, I am sure, read with interest by all distribution men. This products question is also important in the realm of lighting. We are still searching for the "perfect" burner which will be constructed of some substance impervious to the action of the "products," will not become discoloured, and will emit at the point of ignition a mixture which will be completely consumed and thereby reduce the necessity for adjustment and maintenance to a minimum. This should be well within the realms of possibility now that an increasing number of undertakings are coming under the Gas Regulation Act, which necessitates the supply of a gas of constant calorific value, within limits, and also prescribes a minimum pressure. The only burner I know of which attempts this with success is the "Metro" burner supplied by the South Metropolitan Gas Company. Our lighting load is one that we can ill afford to lose; and everything possible should be done to retain it, and, further, to obtain at least a portion of the new work provided in property being erected.

ADVERTISING.

Under this heading it is interesting to contrast the change of opinion which has taken place with regard to the possibilities of advertising in all classes of business, and not least in the gas industry. At the beginning of this century, it was almost unknown for a gas undertaking to advertise its goods. The only advertising one remembers was that done by the appliance manufacturers. In this connection full credit must be given to the "B.C.G.A." for educating the gas undertakings throughout the country to see the necessity for advertising the goods we have to sell. To-day we are all agreed that continous advertising, both national and local, is not only desirable, but necessary to our present and future prosperity. It is only by constantly telling the public in every possible way the advantages to be gained by the use of gas, that our business can be successful.

We of the distribution side, in our contact with the public, are frequently brought up against the fact that the average consumer still knows very little indeed about the regulation and manipulation of even the most familiar types of appliances; and I am inclined to think that we are all occasionally apt to take too much for granted. I do not for one moment suggest that the average consumer should be expected to dismantle, adjust, and re-assemble appliances; but it is certainly desirable that the functions of gas and air adjusters, for instance, should be understood. It cannot be too often emphasized that all appliances should be kept clean.

In this connection, it is noticeable that there is a tendency to make all types of appliances simple, easily detachable, and readily assembled. This, I venture to think, tends, as much as anything, to popularize the use of gas. The periodic distribution of pamphlets containing instructions, couched in simple language, explaining the use of the various parts of every appliance, is still necessary; but even better is the practical demonstration by the gas undertakings representative after an appliance is fixed.

SMOKE ABATEMENT.

This is a subject which is receiving increasing attention by all classes of the community. During the last decade, the benefits of sunlight and a clearer atmosphere have been sedulously preached, with beneficial results to our business; and slowly public opinion is being led to demand that the abolition of smoke and smoke-producing apparatus shall be taken in hand by the Government of the day.

In this connection, the coal strike of 1921 and the more recent dispute in the coal industry, through which, at the time of writing, we unfortunately are still passing, proved in many

of our industrial centres the possibilities of gaseous fuel for both domestic and industrial purposes, and the advantages to be gained by a clear atmosphere enabling us to acquire that full measure of health and happiness which is not possible in smoky surroundings.

It is also noticeable that even the Daily Press is commenting from time to time on the fact that fog is not so prevalent or so " tasteful " in our large cities to-day as it was twenty years ago. This all emphasizes the necessity of continuous propaganda to strengthen and stimulate that " public opinion " by which alone the abolition of smoke may be completely attained. It may be interesting to mention that this desire for smoke abatement is not by any means confined to this country; and it is as well that we study what is being done in this direction both on the Continent and in America.

GAS AS A LABOUR SAVER.

I sometimes wonder whether we realize what an asset our commodity is to the housewife, in enabling the " daily round " of household duties to be performed. The various appliances that may be brought into operation to enable the average household to be run with the minimum of effort, are so numerous, and their range so varied, that it is not surprising that they gain in popularity as time passes. The peaceful revolution that has taken place in the home has to some extent been made possible by the introduction of gas-heated appliances. The cooker, the toaster, the iron, the water heater, the wash copper, the incinerator, and many others have considerably lessened the daily work in the kitchen; while in the other rooms in the house the gas fire with its accessories for water boiling has gone a long way to solve the servant problem, and enable the housewife to enjoy increased leisure.

The increased popularity of gas has enabled the manufacturer to put on the market an ever-increasing variety of appliances. These need careful inspection and testing by the undertakings' officials. It is desirable that all new appliances should be studied, and as far as possible understood, by all the fitters who are called upon to fix them. Facilities for obtaining this information should be available in the workshops at all times.

It is a good plan to have a testing room where every new appliance can be studied in detail, and its salient features pointed out. Its consumption when in use at different pressures should also be tested, so that a correct answer can be given when the inevitable question, " Is it expensive to use? " is asked.

Mr. RALPH HALKETT said that the gas industry had been revolutionized during the last twenty years, no doubt due to the fact that it had a keen competitor to beat. In the old days there was no doubt a certain feeling that, so long as they supplied gas, their consumers must be satisfied. During the last few years, conditions had changed. They now did all they could to ensure the consumers' satisfaction. It was in this respect that the outside departments played such an important part. Mr. Halkett contended that competition was good.

Mr. S. BROWN (Sheffield) said that, because of its ease of control, gas was superseding other forms of heating in many industrial concerns.

Mr. T. G. LEWIS (Leeds) suggested that a field existed for surface combustion appliances, and thought that this principle would no doubt be used at some time for domestic cooking appliances.

Mr. S. H. PACKER (Bradford, Junior Vice-President) proposed, and Mr. LEWIS seconded, a vote of thanks to Mr. Musgrove.

Mr. MUSGROVE replied.

On the proposition of Mr. R. N. WEBB (Leeds, ex-President of the Association), seconded by Mr. C. T. B. ROPER (Bradford), a vote of thanks was accorded Mr. Halkett and the Directors of the Sheffield Gas Company.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

The first visit of the session was held on Saturday, Nov. 13, when the members inspected the Phœnix Tube Works of Messrs. Stewarts & Lloyds, Ltd., at Rutherglen.

On arrival, the visitors were met by Mr. Satow, a Director, and were divided into parties—each group being provided with a guide—and conducted over the works. No effort was spared by the guides—Messrs. Satow, Ballantyne (Works Manager), Milligan (Assistant Works Manager), and Ellacourt—to explain the manufacturing processes of the three grades of tube and fittings—steam, water, and gas.

INSPECTION OF PLANT.

At the time of the visit the works were idle, for the plant closes down on Saturdays at 6.0 a.m. Because of this, however, a more detailed inspection was possible.

The butt-welding and lap-welding processes were in turn explained—from the flat strips of metal, as cut in accordance with the size of tube to be made, to the resultant article bundled and stored ready for despatch to customers.

The gas producers, which supply the gas for the heating and the welding furnaces; the hydrochloric acid pickling rumblers (for removing scale); the molten zinc baths in which tubes and fittings are immersed during the galvanizing process; the socket-making, socket-screwing, and " specials " or fittings making machines—all these were explained and shown in detail.

Finally, the members were conducted through the engineering shop, in which new machinery is built and all repairs to plant are carried out.

Following the inspection, the visitors were entertained at tea in the dining rooms of the works, run in connection with the Workmen's Welfare Club. Mr. Ballantyne occupied the chair.

Mr. BALLANTYNE remarked that his firm, like most others in the country, had experienced trouble owing to the coal dispute. Only one week, however, had been lost. Last year the output amounted to 60,000 tons, and this year, but for the stoppage, that figure would have been exceeded. He mentioned that 25 p.ct. of their output was for home trade, and a big percentage of the remaining 75 p.ct. for the Colonies. Continuing, Mr. Ballantyne said that the idea that workmen would be put out of a job by the introduction of labour-saving appliances was a fallacy. It invariably resulted in a larger output; and in consequence men were always absorbed in dealing with this increase. He also took exception to the cutting of rates of men on " piece-work." This, too, was a fallacy on the part of employers of labour. A cut was only justified if some means of making the man's work easier, and consequently his output greater, had been devised. He was in favour of giving the men an increased bonus, since, if a man doubled his output, he doubled his firm's profit, and probably there was only half the oncost. Mr. Ballantyne then answered various questions put by the visitors in respect to the firm's products—principally in regard to corrosion, external and internal, of pipe lines laid in the ground. He emphasized the importance of using the heavy description of tube, water or steam section, for underground work, owing to its greater capacity for withstanding underground elements. There were still people to be found who would rather save on first costs by using the cheaper quality tube; but daily it was being more and more realized that the heavier gauge tube was the cheapest and best in the end. His firm were still producing the three qualities, which showed there was always a demand. In America, there was only one quality—a moderately heavy section tube. This, he thought, was good practice.

The PRESIDENT (Mr. M. Darling, Cowdenbeath) thanked the firm for the hospitality extended to those present. He also thanked Mr. Satow, Mr. Ballantyne, and the other members of the staff who conducted them round the works.

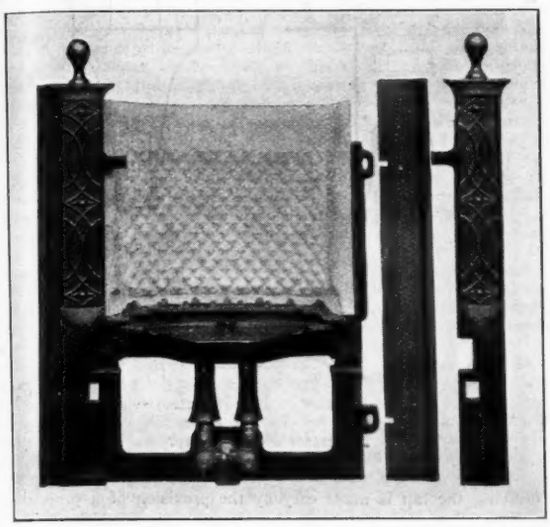
Travel of Gases in Coke Ovens.

An article on " The Coking Process and the Path of Travel of the Gases in the Coke Oven " is contributed by T. Schmidt to the November issue of " Fuel in Science and Practice." He maintains that the total amount of the gases (permanent gas, tar vapours, and ammonia) passing through the uncoked coal is, under the most favourable conditions, 28 p.ct. by volume and 62 p.ct. by weight, and, under the most unfavourable conditions, 22 p.ct. by volume and 50 p.ct. by weight. These figures naturally do not apply in every instance. Depending on the type of coal, the part played by the plastic layer will be different, owing to variations in thickness, viscosity, and resistance to the passage of gases resulting in a greater or less variation in the path of travel of the gases in one way or the other. However, the figures hold approximately for good coking coals containing from 19 to 22 p.ct. of volatile matter. Most of the decomposition probably takes place in the coke; and the decomposition of the gases and vapours in the coke formed on the top of the charge, after they have passed through the uncoked coal, is of secondary importance. For, apart from the fact that the amount of gas passing through the uncoked coal is small, a layer of real coke only develops on the top of the charge after the plastic layers have coalesced in the middle of the charge, when the gas must pass through the coke. Before this occurs, the coke on the top of the charge is light, porous, and spongy. It is unable effectively to decompose the gas, partly because it has not attained the necessary temperature, and partly because of its fissured and coarsely porous structure, which does not disperse the gas stream sufficiently for effective decomposition.

SUGG'S INSET GAS FIRE.

Concave Arrangement of Radiants.

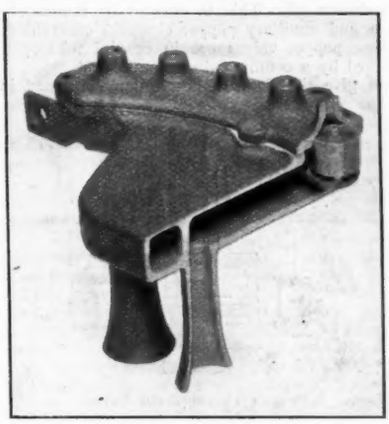
Mention was made in the last issue of the "JOURNAL" of the pleasing appearance of a new series of inset gas fires which is being introduced by Messrs. William Sugg & Co., Ltd., of Ranelagh Works, Chapter Street, Westminster. Several of these fires were seen in action on the occasion of a visit to the



The Gas Fire with One Stile Removed, showing the Accompanying Strips.

works of the firm by members of the Institution of Engineers-in-Charge, when they were the object of a number of complimentary remarks on the score, among other things, of great heating power, silent burning, and attractiveness in design.

Of the various features of this fire, the greatest, perhaps, is the incurving or concave arrangement of the radiants, which has for its object the ensuring of perfect ventilation even in cases where the existing grate canopies are of short, or shallow, projection. Another, and also very important, feature is the special construction of the burner, which has a vertical arrangement of gas feed, served from the centre of the fire. This, together with the patented design of atomizer, results in absolute quiet under working conditions, as well as during the operations of lighting and extinguishing. The burner is fitted with pressure control, and also with gas regulation. A point about the burner, too, is that it can be easily removed—all that is necessary to enable this to be done being the manipulation of two screws, which leaves the radiants in position.

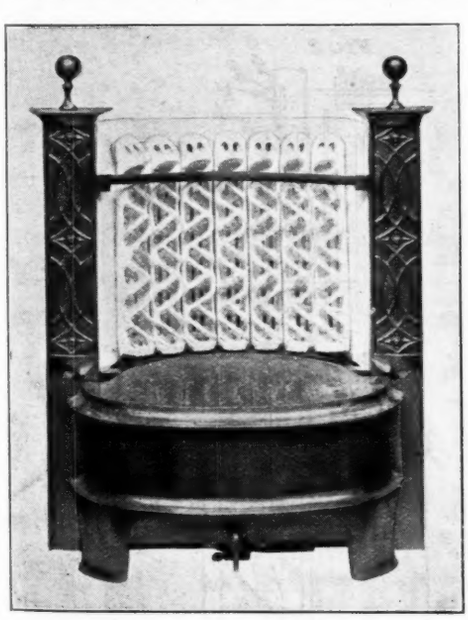


Section of the Burner.

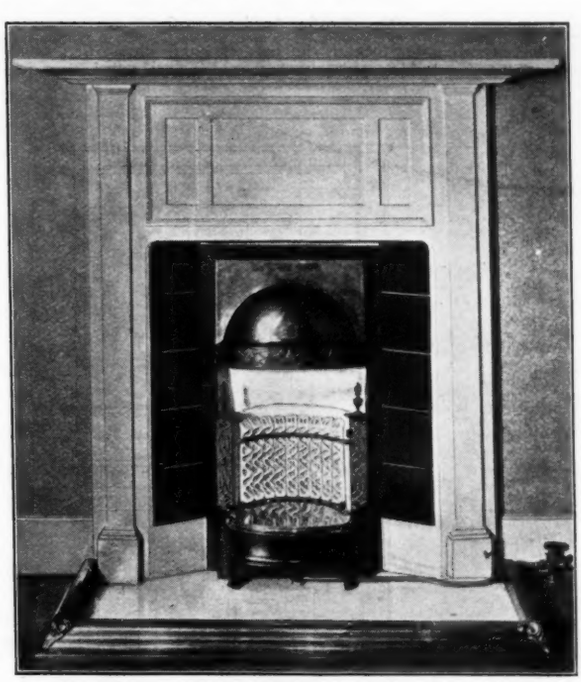
AN EASILY ADAPTABLE FIRE.

This inset fire is readily adaptable to varying widths of grate openings, through the employment of two metal strips which fit behind the stiles of the fire, and over or into the grate mouldings. The metal strips can be easily cut to the desired size. This arrangement permits of a 14 in. fire being employed in a 16 in. opening, or a 16 in. fire in an 18 in. opening, which is a great consideration. The fire is supplied in three sizes—namely, five, seven, and nine radiants—and the two larger sizes can be had with dual control.

A great advantage accruing from the adoption of the fire is that the stiles are common to all sizes, this reducing stock requirements. Similarly, the ornamental front plates are interchangeable between the different sizes of fire, and can be supplied in various finishes.



The Complete Fire, apart from the Grate.



Fire Fitted in Grate.
(Its adaptability is unlimited in this respect.)

Low-Temperature Research.—The Vice-Chancellor of Cambridge University has published a communication received from the Committee of the Privy Council for Scientific and Industrial Research, stating that funds have been placed at their disposal by the Empire Marketing Board, which will enable them to offer a further grant not exceeding £25,000 to the University, for the building and equipping of an extension to the Low-Temperature Research Station. Upon certain conditions set out in the letter, the University authorities are asked to state whether they will accept the offer.

REGISTER OF PATENTS.

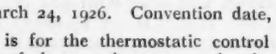
Thermostatic Control of Water Heaters. No. 250,918.

PAIGE, A. E., of Philadelphia.

No. 8060; March 24, 1926. Convention date, April 16, 1925.

This invention is for the thermostatic control of the gas supply to a water heater of the container type, wherein a small flame will keep the stored water hot, while a large flame is required as soon as water is drawn off. This is effected by means of a valve containing main and auxiliary poppet elements controlling ports. The stems of these poppet valves are in coaxial telescopic relationship, and are worked by a common thermostatic rod.

We cannot give the detailed description contained in the specification; but the patentee's broad outline of the invention, in conjunction with a section through the valve, reveals the main features. They are: A burner arranged to heat the water; a main gas valve containing a main fuel gas conduit leading to the burner; a by-pass conduit leading to the burner through the main valve (independently of the control of the latter); an auxiliary valve controlling this by-pass conduit; a spring arranged normally to close the main valve; a spring tending to close the auxiliary valve; a single thermostatic element, extending into the container, and in operative relation with both valves, arranged continually to hold the auxiliary valve open, to a variable extent, and thereby vary the effective area of the by-pass, in accordance with the temperature of the water and arranged to open the main valve at a predetermined temperature, and permit it to be closed, by its spring, at a predetermined temperature.



Paige's Thermostatic Valve.

Locking Gas Cooker Taps.—No. 260,335.

GILBERT, A. G., of Paignton.

No. 18,916; April 24, 1926.

This invention for locking the taps of gas cookers, &c., consists essentially of a locking piece, having a spring-controlled hinge-joint, attached to the supply pipe by a spring clip; the outer end of the locking piece being formed U-shaped and covering the tap handle in its closed position.

Lock for a Cooker Tap.

Freeing the tap is made easy by the provision of a projection on the clip.

We reproduce a side and a front elevation of the device.

Descension Pipes.—No. 260,398.

TOOGOOD, H. J., and DEMPSTER & SONS, LTD., both of Elland.

No. 23,599; Sept. 22, 1925.

The publication of this patent was anticipated by a short article entitled "Stopped Pipes the Bar to Progress" on p. 432 of the "JOURNAL" for Nov. 17, wherein certain advantages of the invention were set out. The considerations which guided the patentees in developing the "descension" pipe for horizontal retort settings are lucidly explained in their introduction to the specification, as follows.

Coal gas was until recent years manufactured to an illuminating or candle-power standard. The candle-power depended, in a flat-flame

FIG. 1.

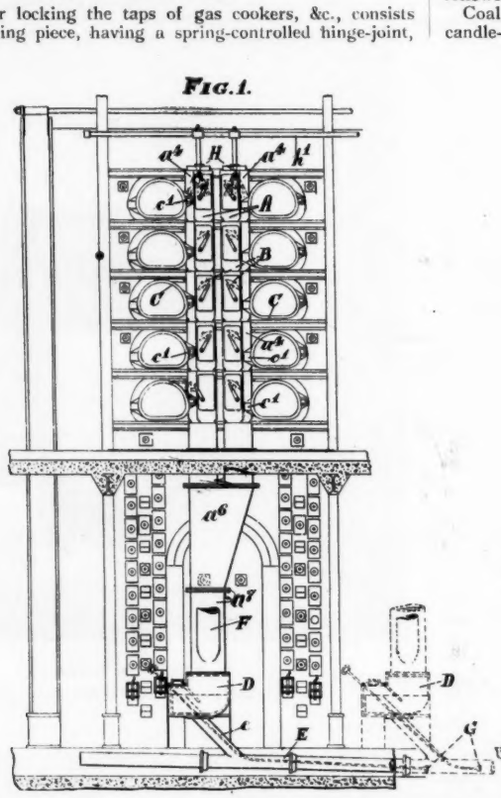
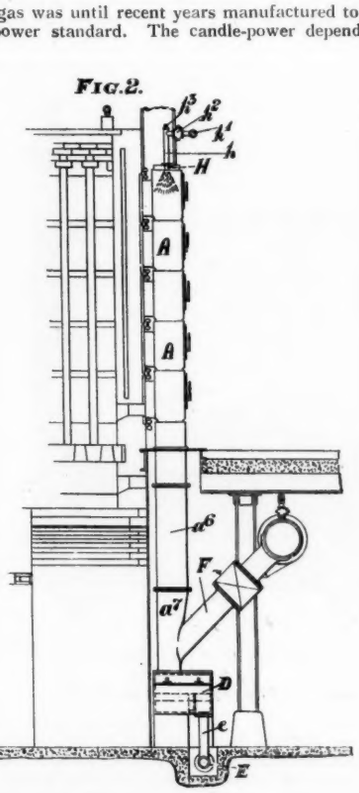


FIG. 2.



RETORT SETTING WITH DESCENSION PIPES.

burner, for its illumination upon a very small percentage of the contained hydrocarbons of the gas; and in order to preserve these delicate hydrocarbons from degradation in the highly complex and little known chemical interaction which takes place in gas manufacture, the trend of invention and practice developed in such a way that the gas was never suddenly cooled. Hence the gas on leaving horizontal retorts passed up ascension pipes adjacent to hot brickwork; was treated in, and its pressure controlled by, the hydraulic-main seal arranged over the hot brickwork; and conveyed away in a foul main, also over the hot brickwork. Thus it may be said that steady, uniform, and slow cooling had become axiomatic in gas manufacture; and so ingrained has become this practice, that though coal-gas is now, and has been for some years, manufactured and sold on a thermal basis, no general departure from this slow and gradual cooling is in evidence. Realizing these conditions, and the arduous nature of the labour of attending to this plant grouped above the heated benchwork, the object of this invention is to provide means, which are in themselves more simple and less costly than present practice per unit of volume of gas dealt with, and which turn to account the greater freedom of treatment of gases (now allowed by the thermal standard) issuing from the retort, to exhaust direct into the foul main, to obviate the inertia of the seal and increase the gaseous thermal yield, to shock-cool the gas, and thereby partially to wash it, and reduce its naphthalene content, to the advantage in economy of later purification treatment, and to save the arduous labour over the hot bench.

Now, the charging and discharging floors being the coolest part of a retort house, in order to apply in practice the theory of shock-cooling, the gas on issuing from the retort must not nurse the heated brickwork, but must descend adjacent to the cooler brickwork to the cooler subway.

Omitting the general outline of the invention, we pass to the detail description, reproducing all the drawings: Fig. 1, a front elevation, and fig. 2, an end elevation of part of a retort bench; fig. 3, a front elevation partly in section of part of the descension pipes drawn to a larger scale and showing the valves in their open and closed positions; fig. 4, a horizontal section of the pipes shown in fig. 3; fig. 5, a vertical section of part of a descension pipe showing a method of mounting the valve; fig. 6, a section taken approximately on line 6–6 of fig. 5; and fig. 7, a vertical section of part of a descension pipe showing a modified construction of joint between two sections.

A indicates the descension pipes, B the valve connections, C the retort mouthpieces, D the seal pot, E the tar and liquor main, and F the gas off-take to the foul main. To accommodate for the growth and expansion of the brickwork, which seriously increases the dimensions between the centres of the retorts, each descension pipe A is formed in a number of independent sections terminating in spigots a and sockets a^1, and having a definite freedom of movement between them. To avoid branch auguring, each section is attached direct to its respective retort mouthpiece by bolts and nuts c; there being only the thickness of the two walls on which any material can lodge. After expansion and growth has taken place, the varying spaces remaining between the spigots and sockets can be closed, or lightly capped by any suitable jointing material. In the modification shown in fig. 7, each socket is formed with an annular channel a^2 which forms a liquid seal with the spigot, and hence maintains automatically a perfect allowance for expansion. If desired, the top of the socket can, after the retort bench is heated and expanded, be lightly jointed or capped with jointing a^3. This construction also acts as an automatic safety valve, as, should a choke occur in any section, the weight of accumulating liquor would blow the seal and prevent the flooding of the retort.

Owing to the spigots being contracted as shown, their inclined walls act as baffles for deflecting the liquor away from the valve openings which communicate with the retorts C. They also increase the time contact between the liquor and gas, and improve the scrubbing action. If desired, to safeguard still further against liquor splashing through the open valve, a gutter a^5 as shown in figs. 3 and 5 may be cast or bolted over each valve opening.

In the construction shown in figs. 1 and 2, the descension pipes A are recessed at a^4 throughout their entire length for the reception of the retort mouthpiece lugs c^1. In the modification shown in figs. 3 to 5, each section of the descension pipe is formed with a pocket a^5 to receive the lugs c^1, the cross-sectional shape of the pipe being as shown in fig. 6.

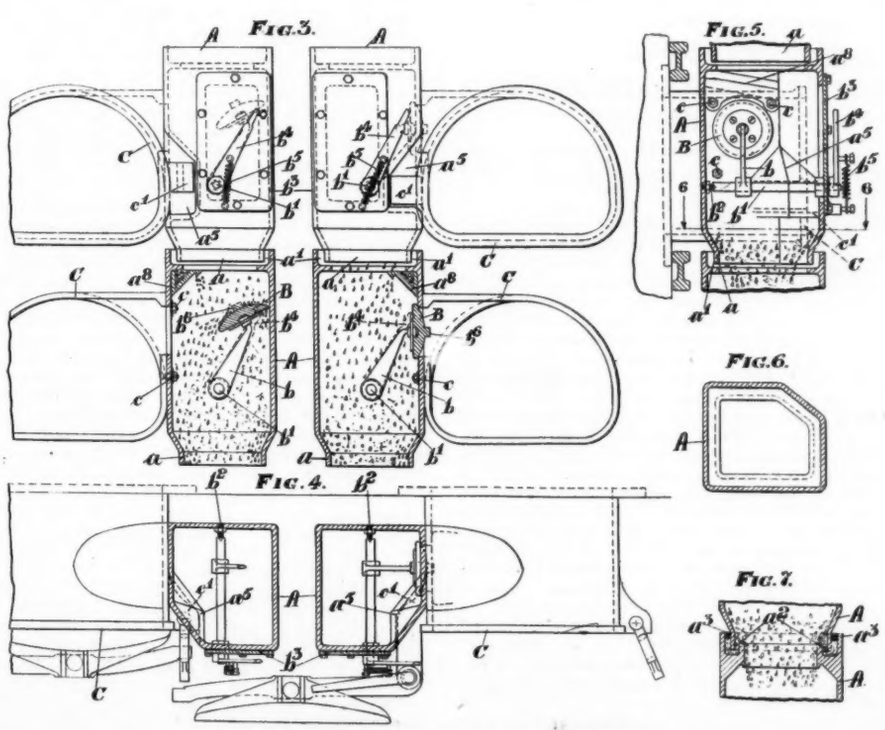
A preferred form of valve connection between the retort mouthpiece and the descension pipe comprises a self-centring valve B freely and rotatably mounted on an arm b rigidly fixed on a shaft b^1, which is carried at one end by a centre b^2 and at the other end by a cover plate b^3 attached to the descension pipe A. The outer end of the shaft b^1 is fitted with a hand lever b^4 connected to one end of a spring b^5 of which the other end is connected to the cover plate b^3 in such a position that it will hold the valve tightly in either closed or open position. This outside hand lever b^4 is keyed in alignment with the interior valve. When the valve is in its open position, its face is presented to the descending liquid by which it is washed and kept clean. The valve is formed with a projection b^6, suitably shaped for a key, by which the valve can at any time be ground upon its seating while the descension pipe is working.

The lower ends of the descension pipes terminate in a box a^6 connected to a pipe a^7 which leads directly to the seal pot D, and is formed of twice the cross-sectional area of each descension pipe A, thus giving plenty of time for the scrubbing and cooling action on the gas from the nearest retorts. Branching from the descending pipe a^7 at an acute upward angle is a pipe F connected with the foul main. The impalpable solid particles are precipitated as the whirl of the descending crude gas suddenly changes direction; the matter being deposited on the surface of the liquid in the seal pot, instead of on to a pipe which would require more cleaning. The pot D is connected with the tar and liquor main E by a branch pipe e arranged at a sufficiently acute angle to allow a flexible augur G to clean through to the next bend, whereby this tar and liquor main can be more readily kept clean without loosening a flange or spilling any liquor.

Ammoniacal liquor is sprayed by nozzles H or other devices through branch pipes h in valved connection with a circulation pipe h^1, through which the liquor is circulated at the desired rate; and means for cleaning the spray nozzles are incorporated, such as a stop cock h^2 and a cleaning cock h^3.

The patentees recognize that it has been proposed to use a single waste pipe for a series of retorts, and to spray liquid into the pipe at the top; but in this case the gas was delivered downwardly in the pipe to a hydraulic main arranged below the retorts.

The main claim is for: Apparatus for the manufacture of coal gas comprising the combination with a group of retorts of a descension scrubber pipe in valved communication with each retort and terminating with a seal pot and a direct gas discharge to foul main arranged below the level of the charging and discharging floors.



DETAILS OF DEMPSTER'S DESCENSION PIPES, &c.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 24.]

Nos. 28,666—29,406.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.—"Water heater." No. 29,022.

BYRON, D. H.—"Gas or air pumps." No. 29,317.

DONALD, W.—"Distillation of coal." No. 29,006.

HOWLETT & CO., LTD., M.—"Gas burner nozzles." No. 28,996.

KEITH, G., and KEITH & BLACKMAN COMPANY, LTD., J.—"Controlling gas burners for furnaces." No. 29,248.

KOPPERS COMPANY.—"Gas purification." No. 29,040.

LOW, J.—"Machine for loading coal on to conveyor." No. 29,010.

OOSTDIJK, K. K.—"Gas oven." No. 28,828.

PRIEST, C. F.—"Vertical gas-fired kilns." No. 28,915.

ROSE, A. G.—See Howlett & Co., Ltd., M. No. 28,996.

SIEMENS & HALSKE AKT.-GES.—"Gas-testing apparatus." No. 28,891.

STILES, W.—See Aldershot Gas, Water, and District Lighting Company. No. 29,022.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

SPECIAL ORDERS.

Farnham, Godalming, Hampton Court, Herne Bay, Salford, United District, and Widnes Gas Orders: Agreed to.

Hoddesdon, Leighton Buzzard, Ludlow, Redditch, and Warrington Gas Orders: Referred to the Special Orders Committee.

HOUSE OF COMMONS.

SPECIAL ORDERS.

Farnham, Godalming, Hampton Court, Herne Bay, Salford, United District, and Widnes Gas Orders: Approved.

Hoddesdon, Leighton Buzzard, Ludlow, Redditch, and Warrington Gas Orders: Copies presented.

Coke Prices.

The question of coke prices was raised in the House of Commons on Nov. 18, when Sir Charles Oman asked the Secretary for Mines whether he was aware that in small places local gas companies have been demanding over 80s. a ton for coke, from which they have already extracted gas, and if he could take steps to prevent excessive prices being charged.

Colonel LANE-FOX, in his reply, stated that he was aware that £4 per ton and more was being charged for coke in many places, but pointed out that for some months past gas companies had been dependent almost entirely upon foreign coal, which produced a relatively low yield of coke, and for which very high prices had been paid.

Scientific Treatment of Coal.

Mr. G. HALL, on Nov. 22, asked the President of the Board of Education if he was aware that it was claimed that, as the results of tests in the transmutation or liquidation of coal into oil, an average of from 40 to 70 p.ct. of the actual coal weight could be converted into oil; and what progress, if any, was being made by tests and experiments in the scientific treatment of coal in this country.

Lord E. PERCY stated that the Government were aware of the claims referred to, and were in possession of the results of numerous experiments on the subject. The process was not yet in use commercially, but experiments were being continued both at H.M. Fuel Research Station and elsewhere. Progress was being made by tests and experiments in the scientific treatment of coal in this country.

NOTICES GIVEN OF BILLS (SESSION 1927) RELATING TO GAS, &c., UNDERTAKINGS.

Notice has been published of the intention to promote in the 1927 Session of Parliament the following Bills containing clauses having reference to gas undertakings.

Birmingham Corporation.—The Corporation seek authority for the extension of the city so as to include the urban district of Perry Barr, and for the supply of gas by them in the added area.

Bognor Gas Light and Coke Company.—This Bill will contain both gas and electricity clauses, and in each case extension of the limits of supply is desired. In regard to gas, the proposals will include the repeal of the powers of the Littlehampton Gas Company to supply gas in the parish of Climping. The Company will ask for additional capital and borrowing powers, and for authority to change their name.

Commercial Gas Company.—The Bill has for object the alteration or abolition of the standard rate and sliding-scale of dividend now applicable to the Company, and determination of dividends payable by new methods, to prescribe a new standard or basic price, to alter or annul the existing standard price, to prescribe a new standard or basic rate or rates of dividend on ordinary capital, and to permit payment of dividends thereon at a minimum rate or rates irrespective of the price charged for gas. To provide for the application of the profits of the Company, or any part thereof, or profits in excess of those required to pay certain dividends, to reduction of the price of gas, to increment of dividend, and to co-partnership bonus to employees, or in any of those ways. To prescribe the calorific value of gas to be supplied by the Company. To make or amend provisions as to prepayment meters and gas supplied thereby. To confer on the Company further financial powers, and for other purposes.

Coventry Corporation.—One part of this Bill is to empower the Corporation to acquire the undertaking of the Kenilworth Gas Company, and to extend the Corporation's limits of supply; to enact provisions with regard to the quality and pressure of the gas supplied, and the setting-up of a calorific power standard; and to enable the Corporation to borrow further money.

Farnham Gas and Electricity Company.—This is a Bill to confer further powers upon the Company in connection with their gas and electricity undertakings, including the construction of works in and under streets throughout their limits of supply, and the extension of their powers of entry upon premises and of cutting off of supplies. The Company desire further borrowing powers.

Leeds Corporation.—Power is to be sought by the Corporation to acquire the undertaking of the Crossgates, Halton, and Seacroft Gas Company, Ltd., and to extend the limits of supply.

Manchester Corporation.—By a Bill of which they give notice, the Corporation will ask authority to extend the city and township of Manchester, and to purchase parts of the undertakings of the Stretford and District Gas Board and the Altrincham Gas Company.

Matlocks Urban District Council.—Notice is given of their intention to introduce a Bill by the Urban District Council of the Matlocks, who seek, among other powers, an extension of their existing gas limits to include the parish of Dethick, Lea, and Holloway.

Mountain Ash Urban District Council.—The Council propose the promotion of a General Bill to confer, among other things, further powers with regard to their gas undertaking and the supply.

Reading Gas Company.—A Bill is to be promoted by the Company to enable them to acquire scheduled land for gas purposes, to raise additional capital, to increase the precribed sum for the reserve fund, and for other purposes.

Salford Corporation.—A General Bill to be promoted by the Corporation will contain clauses to confer upon them further powers as to recovery of sums payable to them in respect of the provision of fittings, apparatus, or appliances in connection with the use of gas.

Scarborough Gas Company.—This is a Consolidation Bill. By it the Company will seek the re-definition and extension of the lands upon which they may manufacture and store gas and residual products, and of the limits for the supply of gas; the alteration of the statutory provisions affecting the quality and pressure of, and the charges to be made for, gas supplied; the establishment of the thermal basis of charge, with a basic charge and rate of dividend; the re-definition of the capital; and power to raise further money.

Smethwick Corporation.—The Corporation will seek power to extend the borough so as to include the urban district of Oldbury, and to abolish the Oldbury Urban District Council; and to extend their limits for the supply of gas so as to include therein the whole or part of the added area.

South Staffordshire Mond Gas Company.—The Company intend to promote a Bill which will give them authority to sub-divide the shares. They will also seek to have conferred upon them additional powers as to working up and conversion of residual products and materials, and as to manufacturing other products on lands in the urban district of Tipton; purchase and sale of residual products and materials and of products of working up, conversion, or manufacture; power to manufacture and store gases in addition to those which the Company are authorized to manufacture on the said lands, and to manufacture and store certain acids and other chemicals on any lands belonging to them; to extend to some of their lands certain of the powers contained in the Company's Act of 1901; and to invest in the capital or securities of other companies, bodies, or local authorities.

Stoke-on-Trent Corporation.—This is a Bill to authorize the laying and maintenance of gas mains from the Etruria Gas-Works of the Corporation through the urban district of Wolstanton United to the Corporation's Longport Gas-Works. The Bill will also relate to borrowing powers, and will contain some general clauses.

Wallasey Corporation.—This Bill will have for one of its objects to extend the boundary of the borough and of the township of Wallasey, and to make provision for the inclusion of the added areas within the limits of the Corporation for the supply of gas, and for acquiring the rights of various authorities in this respect. The Bill will also contain further provisions with regard to the gas undertaking of the Corporation.

West Bromwich Corporation.—The main object of a Bill of which the Corporation have given notice is to extend the boundaries so as to include a portion scheduled of the urban district of Perry Barr; and they desire to extend their limits for the supply of gas so as to include the added area, and to exclude this added area from the limits of supply of the Corporation of Birmingham. They seek authority to purchase, and the Birmingham Corporation to sell, all gas mains and other works in the added area at such price as, failing agreement, shall be settled by arbitration.

MISCELLANEOUS NEWS.

BRITISH SULPHATE OF AMMONIA FEDERATION, LTD.

Broadening the Organization.

The Sixth Annual General Meeting of the Federation was held at the head office, 30, Grosvenor Gardens, S.W. 1, on Thursday, Nov. 18—Mr. D. MILNE WATSON, the Chairman, presiding.

The SECRETARY (Mr. H. Jones) having read the notice convening the meeting and the Auditors' report,

The CHAIRMAN said: During the year under review developments in the nitrogen market have followed along much the same lines as during the previous year. There has been a total increase of nearly 8½ p.ct. in the consumption of all forms of nitrogen, and the demand has been satisfied by a large increase in the output of synthetic nitrogen. Synthetic nitrogen has on balance not only secured the whole of the increase in the world's consumption, but has displaced Chilean nitrate of soda to the extent of about 38,000 tons of pure nitrogen, equal to nearly a quarter-of-a-million tons of nitrate. Synthetic nitrogen now supplies about 47 p.ct. of the world's demand; bye-product nitrogen—chiefly in the form of sulphate of ammonia—accounting for 27 p.ct., and Chilean nitrate of soda for 26 p.ct.

In these circumstances synthetic nitrogen is obviously the dominant factor as far as price-fixing is concerned; and as Germany produces about 70 p.ct. of the world's output of synthetic nitrogen, it is the German price which rules the market.

REDUCTION IN NITROGEN PRICES.

To ensure that their largely increased production would find a market, the Germans last year reduced their prices by about 10 p.ct.; and we were therefore compelled to follow suit. The same causes are in operation once more at present; and, as you know, we have had to make a further reduction of about 8 p.ct. in our prices for the current season. As a result, the British farmer is paying about £1 per ton less this season than he paid a year ago for sulphate of ammonia. I have reminded you about the facts and causes underlying the fixing of prices, although you are fully aware of the situation, because efforts have recently been made in the Press to suggest that some agreement as regards price exists or might advantageously be arranged between the producers of nitrate in Chile and the makers of other forms of nitrogen.

NO AGREEMENT BETWEEN SULPHATE OF AMMONIA AND CHILEAN NITRATE GROUPS.

There is, of course, no foundation for the suggestion. We were able to show in reply to one recent article, which alleged that there had been close correspondence between nitrate and sulphate prices, that, in actual fact, sulphate prices have ranged from 9 p.ct. to 45 p.ct. below the parity of nitrate prices in recent years. In fact, there has been no correspondence at all; and the reason lies in the nature of the case. For the price of sulphate of ammonia has been fixed by the makers of synthetic sulphate on the Continent at a level which will ensure their finding a market for their increasing production. The more nitrogen they can make and sell, the greater profit they can make. Moreover, their source of supply—the air—being unlimited, they need not worry about the future.

The position of the nitrate industry is fundamentally different. There you have a finite source of supply, and therefore the strongest inducement to get the highest price possible. Looking at the question impartially, I cannot see that an agreement artificially to limit output is likely to prove the bridge to span the abyss which divides these positions. The limitation of output will come naturally as the nitrate industry adjusts itself to the lower level of price fixed by the synthetic nitrogen industry.

RELATIVE VALUE OF DIFFERENT FORMS OF NITROGEN.

These remarks are not to be taken as implying any derogation of the value of nitrate of soda as an agricultural fertilizer when used in suitable conditions. But I do wish to protest here against the comfortable theory which is being ventilated in various quarters that nitrate of soda has some mysterious virtue, which makes it the best of all forms of nitrogen in all circumstances, and that it possesses this virtue because it is a "natural" product.

That, gentlemen, is pure nonsense, and every honest modern agricultural chemist will tell you that it is nonsense. As far as agricultural results are concerned, there is no superiority *per se* in "natural" nitrate as compared with "artificial" forms of nitrogen, whether produced as a bye-product or by synthesis. The question as to which forms of nitrogen it is best to use for a given crop and under given climatic conditions must be determined first by the scientific agriculturist, and, secondly, by the relative economic value of all the fertilizing elements required to produce the most profitable result under those conditions.

BIARRITZ CONFERENCE.

This truth was strongly emphasized at the International Nitrogen Conference held at Biarritz last April, at which our friends, the German Nitrogen Syndicate, and we acted as hosts, and over which I had the honour to preside. The objects of that conference were purely scientific; there was no question of any price-fixing arrangement.

It was an attempt to take stock of past achievements in the domains of nitrogen production and use, and to throw some light on future developments. It was, if I may say so without arrogance, an attempt—the first international attempt, I believe—to take an intellectual survey of the whole position in the fertilizer industry, with a view to shaping the future course of that industry along the most useful and profitable lines, alike for producers and consumers. The fact that the most learned members present at the conference admitted that we are only on the threshold of knowledge in regard to fertilizers and their use in agriculture should stimulate all the great fertilizer industries, and especially the nitrogen industry, to pursue scientific research into these problems relentlessly, lavishly, and continuously. I cannot help feeling that conferences such as our conference in Biarritz, when you get round a table the leading authorities and producers in one large industry, are of immense value in the promotion of the good feeling and mutual comprehension which are the indispensable preliminaries to international peace.

NEED FOR BROADER ORGANIZATION.

The formation of the Federation has, I think, been a remarkably successful venture. Some of us have realized this for a long time; but it was only when we set about proposing a change in our organization that we found out that many others thought so too. They have been saying to us lately: "It is only six years since you persuaded us to give up our complete liberty of action, and to accept that mixture of restraint and freedom which still makes the Federation a unique organization. We have found that, on the whole, it has worked well. Why do you want to make a change now?"

It has appeared, however, to some of us that the Federation has now reached a stage in its development when its progress can only continue if it oversteps the limits laid down for it in its constitution. But those of us who are responsible for the proposals which we are putting before you to-day feel that it is far better that the Federation should continue to function within the four walls of its constitution, leaving it to the new Company, Nitram, Ltd., to enter into the full development of the larger aims and powers, for which the Federation has paved the way.

THE NITRAM SCHEME.

Perhaps you will allow me to emphasize what I conceive to be the chief merits of the scheme which has been put before you. It seems to me that they are four in number.

First, the scheme will provide for the Federation the capital which it lacks, and which has become necessary in view of the extension of its activities.

Secondly, the scheme, while providing for adequate expenditure on propaganda by our members, Synthetic Ammonia and Nitrates, Ltd., definitely limits the share of the cost of propaganda and administration which the bye-product member of the Federation will be called upon to shoulder in the future to the very modest sum of 3s. per ton produced—and this, mind you, is a maximum which may possibly be reduced.

Thirdly, the scheme gives the members of the Federation four years' practical trial, in which they can observe for themselves its merits or its disadvantages. If, at the end of May, 1930, the members of the Federation do not consider that the scheme has benefited them, then they will be free to go their own way. If, however, as I hope and believe, this scheme is going to be beneficial to the members of the Federation, then I think that you will all agree with me that its adoption to-day will do more than anything else we could possibly do to provide for the continuation of the Federation after 1930.

The fourth point is that this scheme means the creation of a selling organization which I believe in time will profoundly affect the whole fertilizer position in this country. Agricultural chemists have all along recognized that each different kind of fertilizer has its own special function, and that a well-balanced plant food is made up of all kinds of different ingredients. Naturally, the commercial interests which have been responsible for the production of the various fertilizers have endeavoured to get the maximum sale for the particular product which they happen to be making. Although, as you know, we have not let that fact bias our propaganda work, which has been carried out on very broad and, I think I may say, sane lines, yet the fact that this Federation was formed to sell sulphate of ammonia naturally precludes it from dealing with other fertilizers. That limitation will be removed by the formation of Nitram, for the new Company will be in a position to sell any kind of fertilizer which is required by the farmer.

I think we shall find that, as a result of this liberty of action, the work which Nitram will be able to carry out will be infinitely more beneficial, to both producers and consumers, than the work to which the limitations of the Federation have restricted it.

The Nitram scheme gives the bye-product maker of sulphate of ammonia in Great Britain a very important voice in the conduct of these fertilizer sales and propaganda.

COMBINES AND PRICES.

As regards the international aspect of the matter, I can only point to the fact that similar bodies are already in existence in Germany, France, Italy, and Belgium. The producers in all these countries have found it greatly to their advantage to have a selling organization which could deal, not only with their own particular product, but with all the fertilizers required by farmers; and at the same time you have only got to look at the reduction in prices which have been

partly the result of centralization of production and sales to see that farmers all over the world have benefited very considerably.

In this connection I welcome the formation of Imperial Chemical Industries, Ltd., as a wise step, both in the interest of the nation at large and also in that of the particular groups of producers and consumers mainly concerned. This is an age of mass production; and in order to achieve production on the largest scale, capital and technical resources are required which are beyond the reach of any individual firm. The loss of freedom which it is the fashion to deplore has in many cases merely meant the loss to the individual of the opportunity of making profits calculated on an unnecessarily high cost of production and distribution at the expense of the consumer—an opportunity of which he is deprived by the advent of the combine or trust, which can both produce and sell at a cheaper cost. It seems to me that the bigger the combine, the greater are the number of points at which its activities touch public life, and the greater, therefore, the influence of public opinion upon it. That in itself is a very considerable safeguard for the consumer.

The formation of Imperial Chemical Industries, Ltd., is, I think, an additional reason for recommending members of the Federation to agree to the Nitram scheme.

NITROGEN FOR GRASSLAND.

I referred in my remarks last year to the new system of grassland management which we were trying to introduce in this country. This new departure is still in the experimental stage; and until we have been able to collect the results of the experiments which we are now conducting throughout the length and breadth of the land, I do not wish to make any statement which is likely to induce farmers to try the system in unsuitable circumstances.

But the results of the experiments which we have already obtained, notably those at Brunton's Farm in Yorkshire and at Crofthead Farm in Cumberland, are sufficiently definite to warrant the description of the new system as a successful revolution in farming practice.

On land where there is a sufficient supply of water, and given a correct solution of the problem of the excess and deficiency of keep which is liable to arise under the new system, there is no reason to doubt that a given acreage to which heavy dressings of nitrogen are applied will provide the necessary food for three or four times the number of beasts which it was possible to feed under the old system.

It has long been known that young grasses contain more nutritious food than old grasses, and the new system takes full advantage of this fact. Those farmers who have successfully tried the new system have already found that it makes a large diminution in their cake bill possible. As the system becomes better known, it will lead to a large reduction in the farmer's present outlay on cattle foods, and also bring about an enormous increase in the home production of milk, beef, and mutton. The economic consequences will, I think, prove startling. The success of the new system, as far as it has been tried, is already provoking questionings in regard to hitherto accepted beliefs.

FOOD PRODUCTION IN GREAT BRITAIN.

Up to now we have been inclined to judge the position of agriculture by the number of persons to which it gave employment, and the total supply of food which it provided—that is really the Continental view.

Under post-war conditions on the Continent, it is imperative that the maximum production of food containing the maximum number of calories should be obtained, so as to avoid importation of foodstuffs as far as possible; and that policy means intensive development of arable farming.

It is suggested that we in Great Britain have got to take a different view. It is impossible for us to produce all the food we need; and as our general economic condition enables us to import food, it is argued that we should concentrate on producing foods with a maximum economic, as opposed to a calorific, value. In other words, are not people who deplore the decrease in the wheat acreage overlooking the fact that we can obtain a much better economic result on balance by concentrating on the production of milk and beef, which have a high economic value, and by buying our cereals from countries which can produce wheat at a lower cost than we can?

Instead of deploring the reversion to grassland, should we not welcome it, provided the greater quantities of food produced from grass are used to the best economic advantage? These and the technical problems connected with the new system of applying heavy dressings of nitrogen to grass will have to be solved by economic foresight and scientific experiment.

TRIBUTE TO PROPAGANDA STAFF.

While the Germans, and especially Dr. Warmbold, must readily be given the credit for the practical application of the new system, the progress which the idea has already made in this country, and the readiness which farmers all over the country are now showing to experiment on a practical scale, are due almost entirely to the personal efforts made by our Propaganda Manager, Mr. T. H. J. Carroll, and his able staff of helpers. Mr. Carroll, while fully aware of all the difficulties connected with the application of the new system, is finding the means of adapting it to our conditions here. But he has done something even more difficult than this—he has persuaded a large and increasing number of British farmers to make a radical change in their method of farming. The fact that the new system is being tried on such an extensive scale is, I think, a fine tribute to Mr. Carroll's energy, ability, and initiative, and a gratifying recognition of the soundness of our propaganda work by the British farmer.

There are so many problems in connection with the new grassland system that a large amount of money will have to be spent on scientific investigation. The more we spend on such investigation, the more rapidly shall we be able to answer the questions which are being raised by the new system, and the more rapidly shall we be able to get the full benefits from it.

The report and accounts having been adopted unanimously, a resolution proposed by the CHAIRMAN and seconded by Mr. S. HENSHAW, to appoint Nitram, Ltd., sole selling and propaganda agent for the Federation till 1936, was carried *nem. con.*

A resolution *re* Auditors' remuneration, moved by the CHAIRMAN and seconded by Mr. R. HALKETT (Sheffield Gas Company), was then carried.

On the motion of Mr. H. SMITH (Coppée Company (Great Britain), Ltd.), seconded by Mr. T. E. HASLAM (Dinnington Main Coal Company, Ltd.), Thomson McLintock and Co. were reappointed Auditors.

On the motion of Mr. A. READ (Bolckow, Vaughan, & Co., Ltd.), seconded by Mr. WILLIAM PHILLIPS (Luton Gas Company), a resolution to re-elect Mr. D. Milne Watson Chairman, and Mr. E. J. George (Consett Iron Company, Ltd.), and Mr. S. Henshaw (Staffordshire Chemical Company (1917), Ltd.) Vice-Chairmen for the ensuing year was carried with acclamation.

The Chairman, Mr. E. J. George, and Mr. William Fraser (Scottish Oils, Ltd.) were then nominated as the Federation's representatives on the Board of Nitram, Ltd.

Votes of thanks to the Executive Committee, the Special Committee on the Nitram proposals, and the Propaganda Committee, proposed by Mr. HASLAM, Mr. READ, and the CHAIRMAN, and seconded by Captain T. W. ADAM (Monckton Coke and Chemical Company, Ltd.), Mr. H. SMITH, and Mr. H. H. BARRETT (John and James White, Ltd.), were carried unanimously; and Mr. A. STANLEY (Simon-Carves, Ltd.), Chairman of the Propaganda Committee, returned thanks on behalf of that Committee.

The proceedings terminated with a hearty vote of thanks to the staff, moved by the CHAIRMAN and seconded by Mr. R. C. MILLER (Scottish Oil Agency, Ltd.), which was acknowledged by Mr. F. C. O. SPEYER (General Manager) and Mr. G. A. BLACK (Export Department).

SIXTH ANNUAL REPORT.

The past year was the twenty-ninth year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, and the Federation.

THE WORLD'S SUPPLY OF NITROGEN.

A further increase of nearly 8¾ p.ct. on last year's figures has taken place in the consumption of all forms of nitrogen during the year under review. Owing to the growing number of producing units, and the diversity of the forms of production, it is becoming difficult to present accurate statistics, and the following figures must be regarded to some extent as estimates:

World Production of Nitrogen in Tons of 2240 *Lbs. of Pure Nitrogen, for the Year ended May* 31.

—	1924-25.	1925-26.
Bye-product sulphate of ammonia	290,300	305,700
Synthetic sulphate of ammonia	254,800	289,000
	545,100	594,700
Cyanamide	115,000	150,000
Nitrate of lime	25,000	30,000
Other forms of synthetic nitrogen	66,000	119,000
" " bye-product "	32,400	27,500
Total production	783,500	921,200
Deliveries of Chilean nitrate of soda in consuming markets	363,000	324,200
	1,146,500	1,245,400
Estimated total for agricultural consumption	983,100	1,072,000

As the stocks of bye-product and synthetic forms of nitrogen were not heavier in May, 1926, than at the end of the previous consuming season, the increased production of synthetic forms of nitrogen shown by the above figures may be regarded as having been consumed.

It will be observed that the increase in the output of forms of nitrogen other than Chilean nitrate of soda is estimated at about 21 p.ct., whereas the consumption of Chilean nitrate has fallen by about 10 p.ct. The increase in the consumption of synthetic forms of nitrogen has once more been obtained at the cost of a heavy reduction in price; and prices for bye-product sulphate of ammonia have been about 10 p.ct. lower than for 1924-25. By maintaining their prices at the previous year's level, the Chilean producers have had to forgo a portion of their previous share in the world's market, equal to nearly 200,000 tons of sulphate of ammonia.

The dominant factor in the situation has been the synthetic production in Germany; and the announcement by the German Nitrogen Syndicate in April, 1926, that the works controlled by them had reached an output equivalent to 600,000 tons of pure nitrogen per annum came as a shock to the market. Germany is now turning out during every two months more than the total annual production of nitrogen in the United Kingdom prior to the coal stoppage. Her annual production accounts for 66 p.ct. of the world's output of nitrogen other than Chilean nitrate of soda. It is not surprising that strong efforts are being made in other countries to attempt to redress the balance, nor to find that building programmes intended to produce an additional 300,000 tons of synthetic nitrogen per annum have been mooted in America, Belgium, France, Italy, and the United Kingdom, not to mention more nebulous projects elsewhere. Although it does not seem likely that more than one-third of this increased output will be reached before the end of 1927, a considerable immediate increase in German production must be looked for.

While it may be true that the normal increase in the world's demand for nitrogen will in a few years call for output far exceeding the productive capacity of the present and near future, and while nitro-

gen may be the means of falsifying the gloomy predictions made by Sir Daniel Hall at the 1926 meeting of the British Association, it must be admitted that the prospect before the producer of bye-product sulphate of ammonia is not bright.

For it is clear on the one hand that synthetic producers expect to be able to bring about further considerable reductions in selling price as a result of economies in working, and, on the other hand, that no substantial decrease in the cost of converting bye-product ammonia into sulphate of ammonia can be expected, if present methods of production continue to be used.

The uniform product of the synthetic works, with its white colour and large crystal, is making the sale of bye-product sulphate of ammonia, with its varying colour and condition, more difficult; and a fresh menace is at the same time arising in the shape of the new compound fertilizers made at the synthetic nitrogen works from raw phosphate and air nitrogen. For these compounds containing 52 p.ct. of water soluble phosphoric acid and 20 p.ct. of nitrogen seem destined to deal a severe blow at the superphosphate industry; and the superphosphate manufacturer is at present one of the chief absorbers of bye-product sulphate of ammonia for his compounds.

Some drastic alteration in present methods of turning to account the ammonia obtained at bye-product works seems necessary, if bye-product ammonia is not in future to represent a charge rather than an item of revenue in the accounts. Concentration of production at a few large works so as to secure economy in working and the possibility of using a cheaper acid radicle than sulphuric acid should lead to reduction of costs and greater uniformity of product; but many formidable technical difficulties stand in the way of the realization of such a plan.

World Production and Distribution of Sulphate of Ammonia.

The figures given in the table below, showing the world's production and consumption of sulphate of ammonia, are necessarily to some extent estimates; but they probably convey a reasonably accurate picture of the general position for the fertilizer years ended May 31, 1925 and 1926. We have slightly altered the figures given in our annual report for 1925 in the light of information which has reached us since its issue. (1 ton = 2240 lbs.)

Sulphate of Ammonia.	Production.		Consumption.	
	1925.	1926.	1925.	1926.
	Tons.	Tons.	Tons.	Tons.
Group 1.—Germany, United Kingdom, France, Belgium, Holland, Scandinavia, North Russia, Poland, Czecho-Slovakia, and Switzerland .	2,066,000	2,152,000	1,642,540	1,570,000
Group 2.—Countries bordering the Mediterranean other than those in Group 1	43,000	75,000	213,440	265,200
Group 3.—Indian Empire, Philippines, Straits, Dutch East Indies, Siam, Japan, and China	161,900	161,800	452,450	634,600
Group 4.—Africa and neighbouring islands (excluding Egypt)	1,000	800	7,330	10,100
Group 5.—United States, Canada, Central and South America, West Indian Islands, Cuba, and Hawaii .	468,000	567,000	429,520	464,700
Group 6.—Australasia . . .	17,000	17,100	12,010	14,000
	2,756,900	2,973,700	2,757,290	2,958,600

British and American exports of sulphate of ammonia for the last two calendar years were:

Exported from . .	United Kingdom. Tons.	United States. Tons.	Total. Tons.
1924	263,012	115,047	378,059
1925	248,752	122,498	371,250

Home Production and Distribution.

In the following table showing production and distribution, the figures for total production are taken from the Alkali Inspector's report, and relate to the calendar year, while the remaining figures relate to the "fertilizer" year commencing June 1 in each year. Hence, the quantity stated below as exported for "1925" was exported during the year June, 1925, to May, 1926.

—	Total Production of Ammonia as Sulphate of Ammonia. (Based on Alkali Report.)	Production of Sulphate/ Ammonia as such.	Exported. (Customs Returns, excluding Channel Islands and I.F.S.)	Used for Home Agricultural Consumption.	Nitrate of Soda used for Home Agricultural Use.
1924	467,072†	415,000	261,130	153,200	40,000*
1925	442,102†	394,850	223,210	168,650	35,000*

* The nitrate of soda figures are only rough estimates.

† Basis 25 p.ct. ammonia.

Home Agricultural Consumption.

We are pleased to be able to report a substantial increase in the home demand for sulphate of ammonia, amounting to 15,500 tons, showing an improvement of 10 p.ct. on the consumption in the previous year. Deliveries in May would have been still greater had it not been for the general strike, and we therefore look forward with some confidence to a further increase in home demand during the coming year.

The detailed figures for sulphate of ammonia are as follows:

Home Consumption in	Scotland.	Ireland.	England, Wales, and Channel Islands.	Total.
1924–25 . .	42,800	22,600	87,800	153,200
1925–26 . .	44,930	26,140	97,580	168,650

Exports.

There was a decrease of about 38,000 tons, or 15 p.ct., compared with the previous year's figures, in the exports of sulphate of ammonia from the United Kingdom during the year. The falling off was due partly to increased home consumption and partly to reduction of production due to various causes, the chief being the great coal stoppage which commenced on May 1. With the help of purchases made in other countries, we were able to maintain our position in the Spanish market, and our exports to Japan increased by about 12,000 tons over the previous year's figure. Nevertheless, shipments to Japan during the fertilizer year 1925-26 were little more than half what they were in the same period of 1923-24. The reason is the preference which Japanese buyers are giving to the more uniform synthetic product, which is delivered in better condition than most of the bye-product sulphate of ammonia. The total consumption in Japan is estimated at about 440,000 tons, including the local production.

On the other hand, we are pleased to be able to report a substantial increase of about 10,000 tons in the shipments to China. The demand in India and Ceylon is also developing very satisfactorily with the help of our propaganda work. Exports to these countries from the United Kingdom have risen from 3200 tons to 12,000 tons; and the total consumption, which now accounts for nearly the whole of the local production, was about 23,000 tons for 1925-26 as against 13,000 tons for the previous year.

Quality.

Nearly the whole output in the United Kingdom is now of neutral quality; and we are glad to report that some progress has been made in dealing with the tendency of sulphate of ammonia to cake. The Technical Committee set up by the Federation to deal with this problem has continued to issue suggestions to the makers, and a large amount of discussion has taken place in the Technical Press. It is now generally recognized that, in order to avoid caking, a product containing as large crystals as possible and a minimum percentage of moisture should be aimed at, at any rate by bye-product producers.

General Average Prices.

The following are the average prices per ton for all deliveries, home and export, free on rail at makers' works, in single bags free:

—	For 20·4 P.Ct. Nitrogen.	For 21·1 P.Ct. Nitrogen.
	£ s. d.	£ s. d.
1924–25	10 18 0	12 3 6
1925–26	9 11 3	10 18 9

Home Prices.

The following are the prices charged to British farmers per ton delivered to buyer's nearest station in the last two years:

Sulphate of Ammonia.

—	1924–25. Neutral Basis, 21·1 P.Ct. Nitrogen.	1925–26. Neutral Basis, 21·1 P.Ct. Nitrogen.
	£ s. d.	£ s. d.
July	14 0 0	12 5 0
August	14 0 0	12 5 0
September	14 2 0	12 7 0
October	14 4 0	12 9 0
November	14 6 0	12 11 0
December	14 8 0	12 13 0
January	14 10 0	12 15 0
February	14 12 0	12 18 0
March-May	14 14 0	13 1 0
June	12 5 0	13 1 0

Nitrate of Soda.

15½ P.Ct. Nitrogen.

	£ s. d.	£ s. d.
Spring price about	14 0 0	14 0 0

N.B.—The above prices for nitrate are calculated on the same delivered basis as the sulphate prices. The net price at U.K. ports was about £1 per ton less.

Propaganda Work.

This work has been continued under the supervision of the Propaganda Sub-Committee, consisting of Messrs. A. Stanley (Chairman), S. Henshaw, R. C. Miller, R. D. McCowan, and R. Halkett. Mr. T. H. J. Carroll has been responsible for the executive work at home, and the General Manager for the overseas propaganda. The increase of 10 p.ct. in the home consumption is largely due to the good work done by our agricultural advisers. We find that farmers are showing a growing disposition to consult them. Both members of the Federation and merchants have asked us to arrange window displays to draw attention to sulphate of ammonia; and this has continued to prove a useful method of propaganda.

The experiments which have been running during the present season on the new system of grassland management have been very success-

ful. We have gained a great deal of useful information which can be put to good purpose in the future. Successful field experiments and demonstrations have also been carried out on other crops.

We have paid particular attention to the use of sulphate of ammonia for early grazing of lambs, especially in Ireland and the North of England. By making an early application of sulphate of ammonia, the grazier can fatten his lambs much earlier in the season, and therefore get a very much better price.

The development of the sugar beet industry in this country has been followed by a great increase in the acreage. Sulphate of ammonia is eminently suitable for use on this crop; and the consumption of sulphate for this purpose should increase considerably during the next few years.

The special experiments at Rothamsted and at other agricultural colleges in which sulphate of ammonia has been used have proved successful and have attracted a large number of visitors during the past season.

Propaganda abroad has been carried on in India, China, Java, Sumatra, Malay States, Palestine, Egypt, the Sudan, Kenya, South Africa, Spain, Italy, the West Indies, Canada, and the Argentine. The most striking results have again been obtained in India and China. While temporary setbacks are liable to occur in these oriental countries owing to political and climatic disturbances, the prospect for largely increased consumption in the future is alluring. Results are likely to be in direct proportion to the sums spent in research work and propaganda. A specially encouraging feature during the past year has been the increasing tendency of rubber growers to use sulphate of ammonia and other forms of nitrogen.

BIARRITZ CONFERENCE.

At the joint invitation of the Stickstoff-Syndikat, Berlin, and the Federation, a successful conference on propaganda was held at Biarritz in April. The Chairman of the Federation presided, and the participants came from ten different countries. Apart from notably interesting communications, made chiefly by the German representatives, as to progress achieved in the manufacturing and agricultural spheres, the spirit of the gathering was inquiring rather than dogmatic. Dr. Karl Bosch, the Director-General of the I.G. Farbenindustrie, summed-up the position by pointing out that the amount of knowledge at present available as to the essential factors governing propaganda for fertilizers is extremely small, and that scientific inquiry into these problems must be liberally supported by the nitrogen industry.

MEMBERSHIP.

The Federation numbered on June 1, 415 members (a decrease of 13 on 1924-25), whose annual production represents about 90 p.ct. of the total annual output in Great Britain and Ireland on the basis of the production for the calendar year 1925. The Federation continues to represent a large proportion of the output in Canada, India, and South Africa. Fifteen members of the Federation, representing a total combined annual output of 1340 tons, terminated their membership on May 31.

NITRAM LIMITED.

This Company was formed during the year to market forms of nitrogen other than sulphate of ammonia in co-operation with the Federation. No liability attaches to the Federation.

ORIENTAL GAS COMPANY, LTD.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Company was held at the London Offices, Finsbury House, Blomfield Street, E.C., on Wednesday, Nov. 24—Mr. STANLEY H. JONES (the Chairman) presiding.

The SECRETARY (Mr. S. Rainer) read the notice convening the meeting and the report of the Auditors; and the report of the Directors and the statement of accounts for the financial year ended June 30 last were taken as read.

The CHAIRMAN: The accounts we present to you for the year ended June 30 last are, you will have observed, framed in a form different from that of previous years; and in explanation I have to say that the Directors have come to the conclusion that the form now adopted is more in accord with the general practice in the gas industry than was the older form, and will be of greater interest to shareholders by reason of the fuller and more detailed information afforded. I now propose briefly to review the figures. In regard to the capital account, you will see that there has been no additional expenditure debited to this, all improvement and extraordinary expenditure on plant, &c., having been charged to the revenue account. The capital paid up has been reduced from 12s. 4·8d. per 1000 c.ft. of gas sold to 11s. 10·8d.—a reduction of 6d. per 1000 c.ft. during the twelve months under review.

THE REVENUE ACCOUNT.

Turning to the revenue account, and comparing on a similarly revised basis of account for last year, coal cost £46,200, as against £50,240 in the preceding year—a saving of £4040, due to a satisfactory revision of some of our coal contracts which we were able to effect acting on the advice of our Director, Mr. Macleod, who has great experience in regard to Indian coal matters. Salaries and wages were much the same as previously. Purification shows a saving of £300. Repairs and maintenance of works and plant exhibit an increase of about £2000. I may mention that we erected a small gasholder at our Howrah Works, where we had only one holder, and that very old and likely before long to need repair, when it would have been very difficult (if not impossible) to carry on at that works without storage accommodation. The meter, stove, and fittings shops at the Sealdah Works have also been re-modelled and re-arranged, with a view to centralizing the work of the outdoor department, and economically and expeditiously handling the gas appliances we sell and let on hire to our consumers. In the distribution department, salaries and wages were slightly less than last year. In main and service work, there has been a small increase of about £450; while in repair and renewals of meters, fittings, and stoves there was a decrease in the aggregate of about £600. Public lamps maintenance cost some £535 more. Rents, rates, and taxes show a large reduction of approximately £5300, due to two years' refund on account of Indian income-tax, the dropping of the Corporation profits tax, and a lower rate of British income-tax. Under management, the first two items remain as before. Salaries and wages were slightly higher, owing to automatic increases granted. Stationery and general charges were also a little more. In the other items of the debit side of the revenue account there is nothing which calls for special reference. On the credit side of the account, gas rental shows an increase of £3479; and rentals of meters and stoves, an increase of £355. As to residual products, coke receipts show a reduction of £7823, due to the serious slump in market prices in Bengal, following the dumping of colliery coke in Calcutta, and also in some measure to the dislocation in our business caused by religious riots in Calcutta, of which you will have read in the newspapers. Our Manager was, in consequence, compelled to reduce the Company's selling price of coke, in order to keep the works clear. Tar also shows a decrease of between £800 and £900; but sulphate of ammonia receipts increased by over £500. I am happy to say that the market for sulphate of ammonia has improved in India. The total revenue receipts from all sources amounted to £142,395, as compared with £146,655 in the previous year—a reduction of £4260. The total expenditure was £115,036, against £122,332, or a saving of £7296. So in the result the balance of profit was £27,359, as compared with £24,323—an increase of £3036. The balance of the net revenue account available for dividend is £56,097, as compared with £48,776 in the previous year; and the Directors propose the same final dividend as last year, of 4½ p.ct., which, with the interim dividend of 3½ p.ct. paid last May, makes 8 p.ct., less tax, for the year. The reserve fund, depreciation account, renewals suspense account, and exchange equalization account remain as before.

WORKING RESULTS.

With regard to the working results, the Company carbonized 47,623 tons of coal, as compared with 47,963 tons in the previous year. The gas sold was 503,989,500 c.ft., against 483,579,400 c.ft.—an increase of 4·2 p.ct. The schedule of residual products shows that the production of coke and breeze was rather less than last year, tar was rather more, and sulphate was a larger figure. Turning to the balance-sheet, and in particular to the cash position, you will observe that cash at bankers and in hand is £4086. This compares with £2639 last year. The investments, at £19,657, remain as before. The loan from the bank is £49,285, which is less than last year by £8410. Coming to matters not recorded in the accounts, there has been during the year an increase of 1119 stoves, geysers, gas heaters, and other appliances, and 135 lamps and burners for lighting purposes installed on our district. The notable events during the past year have been the religious riots to which I have already alluded. These, although they caused some dislocation in our outdoor business, have not, I am happy to say, resulted in any damage to the Company's property. Mr. Snelgrove took steps to protect our men. He had them inside the works, and kept and fed them there, which was a wise course to adopt; for at one time things looked rather bad.

STEADY INCREASE IN BUSINESS.

In conclusion, it is satisfactory to record steady increase in the Company's business year by year. I find that in the period during which I have known this Company (some sixteen years), the sale of gas has increased 68 p.ct. This is greatly to the credit of our excellent Engineer and Manager, Mr. Snelgrove, who, backed by able assistants, headed by Mr. Garsed, the Assistant Manager, gives us untiring and devoted service, often in climatic conditions of a most trying nature. Our best thanks are due to Mr. Snelgrove, his staff, and the employees generally for the satisfactory returns submitted to you, and also to our Secretary, Mr. Rainer, and the London staff, for their ever careful and prompt attention to the Company's business on this side of the world. I should like to congratulate Mr. Rainer especially on the efficient manner in which he has prepared the accounts in their new form. I now have pleasure in proposing the adoption of the accounts, and will ask Mr. Ellis to second the resolution, after which I shall be happy to answer to the best of my ability any questions you may wish to ask.

Mr. BERTRAM W. ELLIS formally seconded the motion.

CAPITAL QUESTIONS.

Mr. E. J. WOOLLEY said it was very gratifying to be able to congratulate the Board once more on the excellent report and accounts that they had presented. It was particularly pleasing to see the accounts in their new form, which made everything much clearer to the shareholders than before. There was one item to which he would like again to draw attention. He had mentioned it, he believed, at the meeting two years ago. On capital account there was still an expenditure of £130,919 beyond the amount of stock issued; and he thought the time had arrived when this sum ought to be capitalized. This could be easily done by means of an issue of ordinary stock at

par. Money so raised which was available could be invested in gilt-edged securities, the income from which would go towards paying the dividend on the increased capital; and it would also put the reserve fund on a more liquid basis.

Mr. PARKER thought the balance-sheet looked as though they could do with more capital in the business, and to this extent possibly a further issue might be advisable. But the way to get rid of the over-spent capital balance was to capitalize it by an issue of bonus stock to the shareholders; and he would seriously put it to the Board whether this ought not to be considered. He saw in the balance-sheet that sundry stores figured at about £26,000, and asked what these consisted of.

The SECRETARY replied that it would be seen that they only detailed coal and residuals. Everything else was lumped together in the one item.

The CHAIRMAN promised that the Board would consider the points which had been raised as to the capital; but he still thought that—having a bank who would accommodate them as their bank did—they would, by taking either of the courses that had been suggested, find the saddle rather heavier on the horse than was the case at the present time. He had been in gas all his life; and his own feeling was that the lowest possible capital charge per 1000 c.ft. of gas was the object for every gas engineer to aim at. The capital of their Company, measured by this standard, had come down year by year; and he wanted to see it reduced to what it was on this side of the world. They had a splendid concern now; but they would have an even better one then. Of course, they wanted to wipe off their bank loan; and they had reduced it during the year by over £8000. What their Manager had always in mind was to cheapen the price of gas, and sell more.

The motion for the adoption of the report and accounts was then carried unanimously.

DIVIDEND AND RE-ELECTIONS.

On the proposition of Mr. H. H. MACLEOD, seconded by Mr. W. G. BRADSHAW, a dividend for the year of 8 p.ct., less income-tax, and less 3½ p.ct. less tax paid in May last, was declared.

Mr. B. M. GILL proposed the re-election as a Director of Mr. Stanley H. Jones, who, he remarked, was the right man in the right place.

Mr. MACLEOD seconded this, and it was unanimously agreed to.

The Auditors (Messrs. S. W. Savage and F. J. Bradfield) were re-appointed, on the motion of Mr. A. R. BURCH, seconded by Mr. WOOLLEY.

VOTES OF THANKS.

Mr. ELLIS, proposing a hearty vote of thanks to the staff in Calcutta and London, for their care of the Company's interests and their work during the past year, said that fortunately in Calcutta it had been a less sickly season than was sometimes the case; but, as the Chairman had already told them, there had been serious religious and social disturbances, and the Manager had had to feed and protect the men. Many of the residents left the city for a time; and these difficulties, coupled with the usual flooding of the town in the rainy season, had thrown a great deal of anxiety upon Mr. Snelgrove and his assistants. They had, however, successfully coped with all their troubles, as the accounts now presented showed. Mr. Snelgrove had been able to take a short leave; and during his absence the business was ably looked after by the Assistant Manager, Mr. Garsed. Mr. Smith, the Works Manager, had been home on leave, and returned very much benefited in health. With regard to the work on the district, the sale of apparatus for domestic purposes had during the year been pushed energetically by Mr. Morrison; and as the point of saturation in some quarters was being reached, he was seeking other outlets for business. Speaking generally, he could only say they owed their warmest thanks to the staff in Calcutta. As to the London office, the Chairman had already referred to Mr. Rainer, whose work had been carried out in the excellent manner they had learned to expect from him.

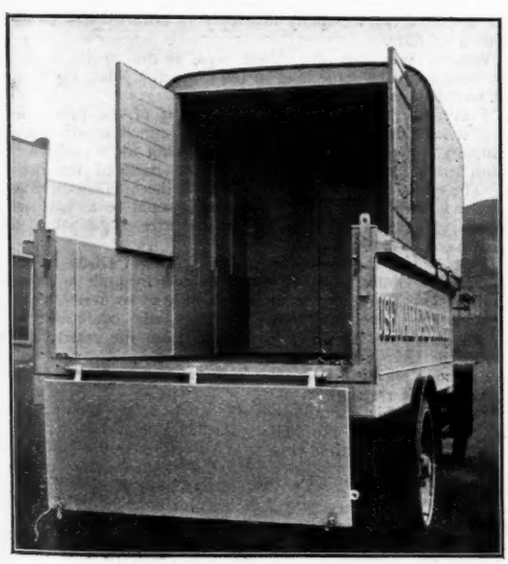
Mr. GILL seconded the vote, which was heartily accorded, and suitably acknowledged by Mr. RAINER.

Mr. PARKER proposed a vote of thanks to the Chairman and Directors, which was seconded by Mr. H. W. MITCHELL, and carried unanimously.

The CHAIRMAN, in reply, said it was a pleasure to work for a Company the shareholders of which were always so appreciative.

A USEFUL VEHICLE.

Messrs. Thomas Glover & Co., Ltd., of Edmonton, manufacturers of gas meters and other gas appliances, have added to their already extensive fleet of "A.D.C." vehicles a further three cars—Associated Daimler Model "506." One of these is of special interest in that it is fitted with a novel boarded tilt body, which has been designed to meet the specialized requirements of their transport service.



One particular problem is the handling of a 1000-light gas meter of the dry type. This is a bulky appliance—so much so that only two can be accommodated in the body which is to be described.

It is essential that all goods are kept absolutely dry in all weathers; and so a boarded tilt was considered the best type. It is also desirable that access to the load should be free and unhampered. It was decided, therefore, that the upper portion of the body should be movable. The upper part of the body is made in two portions; the rear half being made to slide over the front half, so leaving the rear half of the platform clear of any superstructure. As can be seen from the photographs, this movable section is fitted with three rollers on each side, which move in runners fixed at the top of the boarded portion of the side. It will be realized how advantageous this arrangement can be when working loads at the docks—cases, &c., can be lifted straight from the body platform by a crane, without the risk of the roof of the van being damaged in any way. This saves the double handling of cases from vehicle to ground and then by crane.

The vehicle is fitted with a comfortable cab of "A.D.C." pattern, and is separated by 1 in. space from the body, the principal dimensions of which are: Length 14 ft., over-all width 7 ft. 6 in., and minimum clear headroom 7 ft.

The colour scheme is the standard of Messrs. Glover—viz., grey, black, and white.

The chassis used is a standard "A.D.C." Model "506;" the brief specification being:

Engine—"A.E.C." poppet valve, 120 by 150 stroke, developing 45 H.P. at 1000 R.P.M.
Clutch—Inverted cone type.
Gear box—Four speed and reverse, with gate change of the selector type.
Axles—Special steel stampings, rear axle has overhead worm, rear axle worm reduction is 8⅝ to 1.
Frames—Special steel pressings ⅜ in. thick and 8⅛ in. deep.
Tank—30-gallon capacity.

Combined Gas and Electricity Supplies.—Notice is given that the Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them for the supply by the Cranleigh Gas and Coke Company, Ltd., of electricity within part of the rural district of Hambledon, in Surrey.

SOUTHGATE AND DISTRICT GAS ORDER.

On Friday, Nov. 26, Mr. J. F. RONCA (Director of Gas Administration at the Board of Trade) held an inquiry, at the Board of Trade Offices, Great George Street, Westminster, into an application by the Southgate and District Gas Company for a Special Order under section 10 of the Gas Regulation Act. The principal objects of the Order are the conversion and consolidation of stock, the increase of capital and borrowing powers, and the amendment of the maximum price for gas; and there are a number of miscellaneous provisions of a general utility character.

The Gas Company were represented by Mr. A. B. Winser (Messrs. Sherwood & Co., Parliamentary Agents). Objections were raised to some of the provisions of the Order by the Friern Barnet Urban District Council (represented by Mr. G. T. Fletcher, Clerk to the Council), and by the East Barnet Valley Urban District Council (represented by Mr. T. A. Buckley, Clerk to the Council). Mr. C. W. Radcliffe watched the proceedings on behalf of the Middlesex County Council. Objections were raised originally by the Urban District Councils of Southgate and Finchley; but their representatives did not appear at the inquiry.

Mr. WINSER, on behalf of the Company, said that the existing capital of the Company was £15,000 of original ordinary stock at 10 p.ct., £57,500 of additional ordinary stock at 7 p.ct., and £62,500 of 5 p.ct. preference stock—the total, excluding premiums, being £135,000. The proposal was to consolidate and convert those ordinary stocks into one new consolidated 7 p.ct. maximum stock. The basis of conversion was to give £142 17s. 2d. of the new consolidated 7 p.ct. maximum stock for every £100 of existing original ordinary stock bearing a maximum dividend of 10 p.ct., and £100 of the new consolidated 7 p.ct. stock for £100 of the existing 7 p.ct. additional ordinary stock. The dividends were calculated to remain the same on the converted stock as they were before conversion.

ADDITIONAL CAPITAL.

Additional capital to the extent of £50,000 was asked for, with further borrowing powers to the extent of half that amount—*i.e.*, £25,000. The present authorized capital of the Company was £180,000, of which £144,786 had been issued, including premiums, leaving unissued stock to the amount of £35,214; there were also unexercised borrowing powers to the extent of £30,000. With the additional powers sought by the present Order, the Company would have unexercised capital and borrowing powers of £140,214. The Engineer to the Company had estimated that within the next decade or so it would be necessary to expend a total of £113,410. In addition to this, the Company asked for £10,000 working capital, and £5000 to repay bank loan, so that the total was approximately £130,000.

An objection had been raised by the Middlesex County Council to a provision which entitled the Company to pay up to 7 p.ct. on the additional capital issued as preference capital. The Company's answer to this was that there were a great many cases where 7 p.ct. had been justified, and had been allowed by the Board of Trade; and the whole question of the issue of preference capital was really not open to criticism, because the capital had to be issued under the provisions of the auction clauses, and, therefore, it was subject to whatever the market might allow.

The new maximum price asked for was 14·8d. per therm. By the Southgate District Gas (Charges) Order, 1921, the Board of Trade fixed the minimum price at 17·8d. per therm, and last year the Middlesex County Council made an application to the Board for a reduction; but as the result of negotiations between the advisers of the Company and of the County Council, the price of 14·8d. was agreed upon.

With regard to a clause giving the Company power to discontinue the supply of gas where pipes, &c., were dangerous, Mr. Winser said that the London and North-Eastern Railway Company had desired that it should be amended; but the Gas Company, with a view to meeting the Railway Company's objection, and not wishing to amend the clause, had omitted it.

THE OBJECTIONS.

Dealing with the objections, he referred first to that of the Friern Barnet Urban District Council, who contended, in the first place, that the suggested maximum price of 14·8d. per therm was too high, and that, having regard to the continued financial progress and expansion of the Company, a considerably lower maximum would suffice for their probable needs for some time to come. The Council, pointed out that, though the maximum price authorized in 1921 was 17·8d. per therm, at no time since the granting of the 1921 Order had it been necessary to make charges in excess of 14·66d., and the charges had been reduced by stages to the present price of 11d. It was added that it was always open to the Company to apply to the Board of Trade for a Revision Order under the Gas Regulation Act. Mr. Winser said that one of the material facts to consider was that the Company was a maximum price one, and its dividends were not influenced in the same way as those of a sliding-scale concern. Further, it was always open to a sliding-scale company to increase the price to whatever extent they liked, or were forced to; but maximum price companies were absolutely tied down. It was the intention of the Company to raise the price to 13d. per therm as from the next reading of the meters, in consequence of the abnormal conditions prevailing, so that the margin between the actual price and the suggested maximum price would be only 1·8d. per therm. No one could complain that this margin was too great, in view of the fact that the pre-war margin was 3·2d. per therm.

Mr. FLETCHER, at this point, said that the Friern Barnet Urban District Council would not press their objection to the suggested maximum price, having regard to the agreement made between the Middlesex County Council and the Company.

Mr. WINSER, in reply to Mr. Ronca, agreed that the insertion of the new maximum price in this Order would automatically take the price outside the provisions of section 1 of the Gas Regulation Act, thereby eliminating the power of either party to apply to the Board of Trade for revision.

Mr. BUCKLEY, in reply to Mr. Ronca, said that the East Barnet Valley Urban District Council would still press for a lower maximum price.

Mr. WINSER indicated that the Company were prepared to insert a provision giving the parties power to apply to the Board of Trade for the revision of the maximum price.

Mr. RONCA asked whether that would affect the attitude of the East Barnet Valley Urban District Council.

Mr. BUCKLEY said it would not. He pointed out that the area of the Urban District Council was situated in the County of Hertfordshire, and not within the County of Middlesex.

Mr. WINSER, continuing, said the next objection by the Friern Barnet Urban District Council was to a clause dealing with the application of excess of profits over authorized rates of dividend. The clause enabled the Company to carry forward in any year the amount required to pay outstanding dividends and interest for that year, as well as an amount equal to the sum required for dividends and interest in the following year. The contention of the Urban District Council was that any reduction in the price of gas to the consumer which would otherwise be made would be unnecessarily delayed in its operation by the proposals of the clause. The Company's answer to this was that the clause had been granted on numerous occasions to gas undertakers, and that it would enable the Company to avoid bank overdrafts. The East Barnet Valley Urban District Council suggested that a reasonable maximum price for the Southgate Company would be 13d. per therm, and asked that this should be substituted for the 14·8d.

Mr. WINSER reiterated that the Southgate Company intended, as from the next reading of the meters, to raise the price of gas to 13d. per therm.

BULK CONTRACTS—EXPLOITING TENANTS.

Another clause to which objection was taken by the East Barnet Valley Urban District Council was one giving the Company power to contract to supply or purchase gas in bulk. It was pointed out that the Company could contract with any local authority, company, or "persons," and that the clause would enable the owner of a dwelling-house who had converted his house into flats to purchase gas in bulk, so that he might be in a position to exploit the tenants by distributing the gas to them, and charging an excessive price for it. The Urban District Council suggested that power to contract for supplies in bulk should be limited to local authorities, companies, or persons "having statutory authority to make and supply gas." The Urban District Council did not believe, of course, that it was the desire of the Company to supply in bulk to persons such as the owners of flats.

Mr. WINSER said that the clause was in the model form, and, though there might be something in the Council's point, the Company did not feel disposed to make any alteration.

Mr. FLETCHER then put the case on behalf of the Friern Barnet Urban District Council, and said that the Council would appreciate the Company's offer to insert a clause providing for a revision of the maximum price, if that course commended itself to the Board of Trade. The effect of the clause dealing with the application of excess of profits over authorized rates of dividend would be to postpone for at least twelve months any reduction in the price of gas which might otherwise have been made.

Mr. BUCKLEY (for the East Barnet Valley Urban District Council), dealing with the clause giving power to contract for bulk supplies, said that its provisions were open to abuse not only by owners of flats, but also by companies developing housing estates, who could take a bulk supply and distribute it, while being free from the restrictions imposed upon the Company with regard to charges. The Council held that any persons taking a bulk supply from the Gas Company should be under the same restrictions as the Company.

Mr. WINSER, in his summing-up on behalf of the Company, said that, if it would enable the Friern Barnet Urban District Council to withdraw their remaining objections, the Company would be prepared, by private agreement—outside the Order—to undertake to give the Council seven days' notice of their intention to lay mains or pipes, instead of the three days' notice provided for under the Gas-Works (Clauses) Act, 1847.

Discussing the objections of the East Barnet Valley Urban District Council to the proposed new standard price, he said they had overlooked the fact that even 13d., which it was proposed to charge after the next reading of the meters, did not represent the cost to them of supplying gas. The cost of supplying gas for the present half-year, so far as it was possible to estimate it, was 14·45d. per therm; and but for the fact that the Company had a carry-forward from a previous period as a stand-by, the suggested maximum price of 13d. would be grotesque. The cost price of 14·45d. was very close to the maximum price of 14·8d. suggested by the Company; indeed, the margin would appear to be perilously close. Whereas previously the profits of the Company had amounted to £6500 for a half-year, in the present financial period they were likely to amount to less than £500.

With regard to bulk supply, he did not think the amendment suggested by the Council would meet the point they had raised, which might or might not be a real point. At the present moment he saw nothing to prevent a supply being given to the owner of a block of flats, whether the clause were inserted in the Order or not; but, on the other hand, he could conceive that no gas undertakers would willingly lend themselves to an abuse such as the Council suggested. In so far as such a supply could be deemed to be a trade

supply, the Company would be under no obligation to afford it, so that they could come to any arrangement with the person who proposed to take the supply.

At the conclusion of the inquiry,

Mr. RONCA announced that he would report to the Board of Trade in favour of the agreed maximum price being subject to revision.

GAS REGULATION ACT APPLICATIONS.

AMENDING ORDERS.

Colwall Gas Company, Ltd.

To substitute for the existing maximum price of 1s. 6d. per therm a maximum price of 1s. 7d., until Dec. 31, 1927.

Stourport Gas Company.

To substitute for the existing standard prices of 16d. and 17·2d. per therm standard prices of 19d. and 20·2d., until Dec. 31, 1927.

Wirksworth Gas Light and Coke Company, Ltd.

To substitute for the existing maximum price of 1s. 4·8d. per therm a maximum price of 1s. 10·4d., until June 30, 1927.

SPECIAL ORDER.

Newport Pagnell Gas and Coke Company, Ltd.

To extend the limits of supply, to enable the Company to raise additional capital, and for other purposes.

SECTION I.

Thornton Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft., and the price which they have asked the Board of Trade to substitute for this is 1s. 4d. per therm. It is also proposed that an additional charge of 1d. per therm should be authorized in respect of gas supplied through a prepayment meter, and 3d. per therm in respect of gas supplied through a prepayment meter with cooker.

RELAXATION OF LIGHTING RESTRICTIONS.

In the House of Commons last Wednesday (Nov. 24), Mr. Raine asked the Secretary for Mines whether, in view of the improved outlook in the coal industry, it was not now possible to relax the Coal Emergency Directions.

Colonel LANE-FOX, in reply, said: It is, in my opinion, to the best interests of the country to relax these restrictions at the earliest possible moment, even at some risk. Although, therefore, supplies are still far short of the normal demand, output is steadily increasing, and I think that the time has come when practically all the restrictions, except that which prohibits the export of coal, ought to be withdrawn, and freedom restored both to consumers and to the trade. The restrictions on the use of gas and electricity for lighting, heating, and power, and on the use and acquisition of coal by industries, will be withdrawn as from to-morrow [Nov. 25]. The restrictions on the domestic consumer will continue only to the end of the present week. As from to-morrow, also, collieries will be given freedom to dispose of their coal as they please in this country, subject to their fulfilling any allocations made upon them by the District Committees. I regret that the situation does not yet justify removing the prohibition on export; but as from next Monday [Nov. 29] shipments will be permitted freely to Northern Ireland and the Irish Free State.

INCREASES IN THE PRICE OF GAS.

The price at Bristol has been raised to 10d. a therm, from the reading of the meters for the December quarter.

The Directors of the Deal and Walmer Gas Company announce an increase of 2d. per therm from the date of the next reading of the meters.

The Glasgow Corporation Gas Department have given notice that, from the readings commenced on Nov. 27, the charge will be 5s. 10d. per 1000 c.ft.

At Leeds the price is to be raised by 2d. a therm, or 10d. per 1000 c.ft. This will bring it to 5s. 1d. per 1000 c.ft.

The Manchester Gas Committee have increased the price by 7d. per 1000 c.ft., bringing it to 4s. 5d. in the city, and 4s. 8d. to consumers outside.

The Plymouth Corporation Gas Committee have decided to advance the charge to ordinary consumers by 7d. per 1000 c.ft., making it 3s. 6d., as from the quarter beginning Jan. 1, 1927.

The Rochdale Gas Committee have decided to increase the price by 1s. per 1000 c.ft. to 5s. 3d. It was only at the October meeting of the Town Council that sanction was given to increase the price by 6d. per 1000 c.ft.

The Yeadon and Guiseley Gas Company announce the necessity for a further increase in price; and for the current half-year the charge will be 4s. 4½d. per 1000 c.ft.

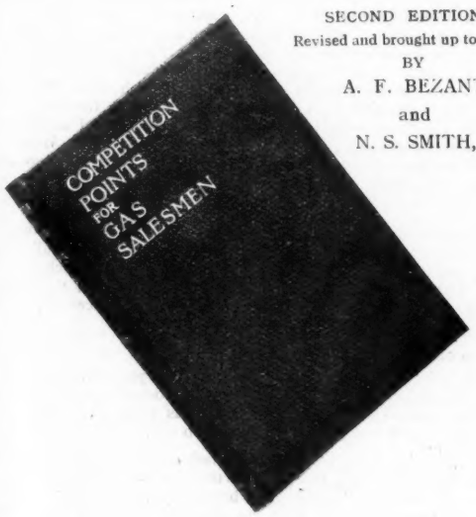
At Wick the price has been increased from 5s. 10d. to 7s. 1d. per 1000 c.ft.

Five men were injured in an explosion which took place last week at the works of the Richmond Gas Stove and Meter Company, Grappenhall, near Warrington. The explosion occurred in one of the ovens.

NOW READY.

COMPETITION POINTS FOR GAS SALESMEN

SECOND EDITION.
Revised and brought up to date.
BY
A. F. BEZANT
and
N. S. SMITH, B.Sc.



Price **7/6** post free.

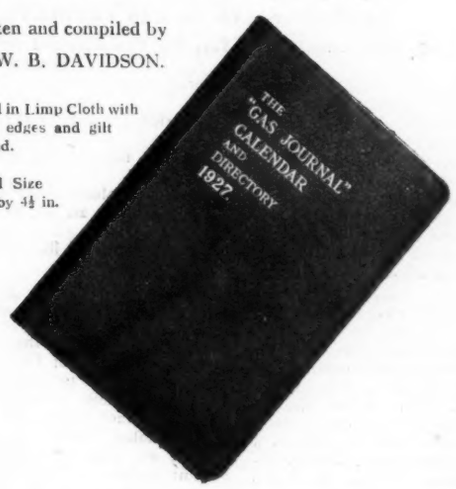
READY THIS MONTH.

THE "GAS JOURNAL" CALENDAR AND DIRECTORY, 1927

Written and compiled by
DR. W. B. DAVIDSON.

Bound in Limp Cloth with round edges and gilt lettered.

Actual Size
7 in. by 4½ in.



Price **7/6** post free.

WALTER KING, Ltd., 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market during the past week has been in such an uncertain condition that practically nothing has been done. The output both in Northumberland and Durham has been steadily increasing, and a general resumption is expected at any time; but the uncertainty as to when the ban on exports will be lifted has made business very difficult.

Shipments of gas coal to London and the South are beginning this week; but collieries are not generally delivering under contract until a general resumption of work is officially ordered.

Until the market opens out fully, it is impossible to give any reliable guidance as to prices. In the first rush, they may quite likely be run up; but those who can wait before buying will probably be very wise to do so. Such figures as 22s. 6d. to 27s. 6d. f.o.b., which are talked of at present, can hardly be maintained for very long. There is undoubtedly a shortage in many parts of the Continent, as well as at home; but it must not be forgotten that much of the lost consumption of the past six months will never be made up, and that replenishing of stocks need only be a gradual process in many cases.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is every reason for hoping for a speedy settlement of the long drawn-out dispute in the coal trade. In Yorkshire, the prevailing feeling is that by the end of the week collieries in this area will be at work. Naturally, there is a very undecided opinion as to future prices and deliveries, and probably the situation will depend entirely upon the local conditions prevailing at each individual pit.

Gas concerns are fairly well covered in respect of supplies, and with English coal available, imported fuel is slightly at a discount. Contracts have been placed for English gas coal, thus indicating that for the first few weeks after a general resumption of work figures are likely to be somewhat better than those which will operate over a period of three or six months.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

There has been the wholesale cancellation of outstanding orders which commonly marks the end, or what may be the end, of a crisis. At the time of writing, collieries have made no alteration in their quotations, and consumers are buying only from hand to mouth. Distributors did not wait for the removal of restrictions before speeding up deliveries from the superabundance of coal on rail and wharves.

It is price that is the controlling factor. Preparations for recommencing the production of iron are confined to blast furnaces which have collieries and cokeries behind them. Furnacemen who have to buy their fuel say they will not stir till they can get coke at a reasonable figure. Pressure for supplies ensures a market for pig iron at high prices; but there are old contracts to be worked off which were taken at about half the prices lately ruling.

Gas-works are now offered coal suitable for carbonizing in large quantities. There is still a big tonnage of foreign coal to be absorbed. It is sold for the most part, of course. The trade is now in the midst of a difficult phase, of which everybody will be glad to see the end.

Renewed offers of Durham coke for the foundries have been received. The prices named at the outset ranged from 55s. to 60s. District collieries wanted as much as 45s. at the pithead for good slacks.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 29.

The values of tar products generally have undergone little change during the past week.

Pitch is somewhat quiet; but the price is steady round about 200s. per ton in bulk at makers' works.

Creosote continues in demand, and is firm at not below 9d. per gallon net in bulk f.o.b.

Pure benzole is about 3s. per gallon, pure toluole about 3s. to 3s. 3d. per gallon, and 95/160 solvent naphtha about 2s. 1d. to 2s. 2d. per gallon.

Crystal carbolic acid is steady at about 7d. per lb. in large drums and overcasks.

Tar Products in the Provinces.

Nov. 29.

The average value of gas-works products during the week were: Gas-works tar, 116s. 6d. to 121s. 6d. Pitch, East Coast, 187s. 6d. to 190s. f.o.b. West Coast—Manchester, 180s. to 182s. 6d.; Liverpool, 182s. 6d. to 185s.; Clyde, 186s. to 188s. Benzole, 90 p.ct., North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 8¼d. to 9d.; salty, 8d. to 8¼d.; Scotland, 7⅞d. to 8⅛d. Heavy oils, in bulk, North, 7¼d. to 7⅜d. Carbolic acid, 60 p.ct., 1s. 9d. to 1s. 10d. prompt. Naphthalene, £11 to £14; salts, 90s. to 100s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Manchester District Tar Prices.

The average prices realized for the sale of tar in the Manchester district, according to the sliding scale, for the months of September and October were £4 12s. 10·91d. and £5 19s. 10·61d. respectively.

TRADE NOTES.

Gasholder for Australia.

Messrs. Ashmore, Benson, Pease & Co., Ltd., have been instructed to put in hand for the City of Perth (West Australia) Electricity and Gas Department, for their new works, a steel tank 77 ft. in diameter, and two-lift spiral-guided gasholder (the same size as the cable-guided holder which they erected at the old works thirty years ago).

Luteless Purifiers.

Messrs. Ashmore, Benson, Pease & Co., Ltd., have received intimation by cable of the acceptance of their tender for supply, delivery, and erection, at Station "A" of the Consumers' Gas Company of Toronto, Ontario, of four luteless purifiers, each 35 ft. by 35 ft. by 10 ft. deep inside, in one box with divisions, to deal with 4 million c.ft. of coal gas per day. They are to be complete with substructure, wood grids, "Parkfield" patent rubber joints and multiple fasteners, lifting gear, oxide chutes, and 24-in. "Pickering" patent centre valve. This is the fifth contract of a similar size entrusted with this firm by the purchasers, who have these installations at both their gas stations.

New Woodall-Duckham Plant at Warrington and Ely.

The Warrington Corporation Gas Department have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for an extension to the existing Woodall-Duckham vertical retort installation at their Longford works. The extension consists of a new bench of twelve 80-in. retorts, with a total daily carbonizing capacity of 96 tons. The contract includes coal handling plant, foundations, and a waste-heat boiler.

The Ely Gas and Electricity Company, Ltd., have also placed an order with the Company for an installation of Woodall-Duckham continuous vertical retorts. This order comprises a bench of three 53-in. retorts, set in single units, and heated by means of two producers situated at the ground level at one end of the bench. The plant will have a daily carbonizing capacity of 15 tons. The contract includes all foundations, a retort house, and a steam engine driven lift to deal with the coal and coke to the plant.

CONTRACTS OPEN.

Meters, Pipes (Cast and Wrought), and General Stores.

The Stockton-on-Tees Gas Department are inviting tenders for meters, pipes, and general stores. [See advert. on p. 587.]

Gas Oil.

The Corporation of Bexhill Gas Department are inviting tenders for the supply of gas oil. [See advert. on p. 587.]

Tar and Ammoniacal Liquor.

Offers are invited by the Corporation of Bexhill Gas Department for the purchase of coal gas and water gas tar and ammoniacal liquor. [See advert. on p. 587.]

Brayshaw Furnaces and Tools, Ltd.

We are advised that Messrs. Radiation Limited have disposed of the industrial section of their furnace business, hitherto carried on at Grappenhall Works, Warrington, together with the business of Brayshaw Furnaces & Tools, Ltd., to Messrs. S. N. & E. R. Brayshaw. Messrs. Fletcher, Russell, & Co., Ltd., of Warrington, will, however, continue to manufacture and supply dental laboratory and general technical apparatus and appliances, which are their own furnace specialities; and the Davis Furnace Company, of Luton, will continue to manufacture and supply their "Revergen" furnace in its various forms. The Brayshaw Company have acquired additional works equipped with modern plant to deal with their furnace trade; and a new catalogue is in the press dealing with the large range of furnaces they now supply. Their milling cutter and small tool products will be manufactured at their Mulberry Street Works, Manchester, as heretofore, where fresh plant has recently been installed to cope with their increasing volume of business.

"British Gas C.C." Dinner.—To celebrate the winning of the cup for the top position in the Second Division of the Hull and East Riding Amateur League, a dinner was held at the Manchester Hotel, Hull. The President, Mr. Harold E. Copp, occupied the chair, and was supported by Dr. John Cumming, Medical Officer to the British Gas Light Company.

The price of gas in Blackpool is only 3s. 1½d. per 1000 c.ft., despite the high cost of coal. The Gas Committee have decided to make no further addition to the price this year. The only increase made since April was one of 5d. per 1000 c.ft.

Considerable progress is being made with the new works of the Preston Gas Company, being constructed at Preston Junction. The scheme involves the laying of a branch railway which will enable coal to be brought direct from the mining areas. A gasholder will be provided with a capacity of 3 million c.ft. The site has an area of 32 acres, and the cost of the work is £200,000. The new station will enable a 50 p.ct. increase of supply to be given.

Mr. Ames, Gas-Works Manager to the Oswaldtwistle Council, states that during the last six months the quantity of gas distributed was 16·44 p.ct. more than in the same period last year. The increase for October was 23·18 p.ct. During October the Department sold: Cookers, 13; fires and radiators, 51; boilers and geysers, 19.

STOCK MARKET REPORT.

DEALERS on the Stock Exchange last week again complained of the paucity of business. The success of the new issues, however, shows that there is plenty of money available for investment, and it can only be concluded that investors prefer to save the expense of buying in the market. It is stated that the oversubscription in the maiden issue of the Ealing Corporation was so large that applicants up to £1000 received only £50 stock. In a few Industrials some activity was noticeable, and speculators were caught on rumours, for which there was some justification, of absorption by the Selfridge combine of Wm. Whiteleys, Ltd. The breakdown in the negotiations caused prices to slump badly.

Gilt-edged securities exhibited a firmer tendency on the improvement in the sterling rate on New York. The lower Treasury Bill rate was another favourable factor. Inquiries at the Provincial Exchanges show that coal shares are improving at Cardiff, but there is little change at Newcastle.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 26.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Aug. 12	5	5	Aldershot 5 p.c. max. C.	72—75	..	..
332,992	,,	,,	4	4	Do. 4 p.c. Pref.	65—70	..	66
1,651,868	,,	Sept. 30	6½	6½	Alliance & Dublin Ord.	88—88	..	..
374,000	,,	July 8	4	4	Do. 4 p.c. Deb.	67—70	..	..
300,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	20/10½—21/4½
170,000	10	Aug. 26	8½	8½	Bournemouth 5 p.c.	12—13	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12—13	..	..
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 24	3	3	Do. 3 p.c. Deb.	54—57	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
214,740	,,	Aug. 26	12	12	Brighton & Hove Orig.	163—168	..	166
244,200	,,	,,	9	9	Do. A Ord.	125—130	..	129—130
1,287,500	,,	July 22	5	5	Bristol 5 p.c. max.	85½—86½*a*	..	..
855,000	,,	Sept. 30	7	8	British Ord.	102—107	..	..
100,000	,,	June 24	7	7	Do. 7 p.c. Pref.	114—119	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	68—73	..	..
100,000	10	June 10	6	8	Cape Town, Ltd.	7—8	..	..
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	July 22	6	6	Cardiff Con. Ord.	94—97	..	..
287,860	,,	June 24	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord.	89—94*b*	..	..
79,185	1	Sept. 30	†2/-	†2/-	Colombo Ltd. Ord.	27/—29/-	..	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref.	20/—22/-	..	..
321,490	1	Oct. 14	1/9‡	1/7½	Colonial Gas Assn. Ld. Ord.	26/—28/-	..	26/6—26/9
173,900	1	,,	1/9‡	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	21/6
1,518,280	Stk.	Aug. 1	5½	5½	Commercial 4 p.c. Cap.	77—80	..	78¾—79½
560,000	,,	,,	5/8/4	5/8/4	Do. 3½ p.c. Cap.	74—77	..	74½
475,000	,,	June 24	3	3	Do 3 p.c. Deb.	55—58	..	..
800,000	,,	Sept. 30	§2	§1	Continental Union, Ltd.	27—32	..	28—29
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	82—85	..	84—85
737,150	,,	Aug. 12	6½	6½	Croydon sliding scale	96—99	..	..
408,100	,,	,,	5	5	Do. max. div.	78—81	..	..
492,270	,,	Aug. 26	9	6	Derby Con.	107—109*c*	..	..
55,000	,,	June 24	4	4	Do. Deb.	73—75*c*	..	..
209,000	,,	Sept. 16	5	5	East Hull Ord. 5 p.c.	84—87	..	..
50,000	,,	June 24	5	5	Eastbourne 5 p.c. Deb.	91—96	..	..
1,002,180	10	Sept. 30	†4	†3	European, Ltd.	6½—7½	..	6⅞
18,788,960	Stk.	Aug. 12	4/17/4	5/1/4	Gas Light & Coke 4 p.c. Ord.	83—85	..	83½—84½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	..	59—60½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74—77	..	76—76½
5,602,620	,,	June 24	3	3	Do. 3 p.c. Con. Deb.	58—61	..	59
181,315	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	..
130,000	,,	—	10	10	Do. 10 p.c. Bonds.	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 26	6½	6½	Hastings & St L. 5 p.c. Conv	87—92	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	66—71	..	68—70
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd.	19—20	..	..
173,200	Stk.	Sept. 16	5	5	Hornsey Con. 3½ p.c.	69—71	..	..
1,976,000	,,	Nov. 11	‡10	10	Imperial Continental Cap.	128—133	..	130—131½
226,170	,,	Aug. 12	3½	3½	Do. 3½ p.c. Red. Deb.	68—71	..	..
235,242	,,	Aug. 12	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	..
2,127,340	,,	Aug. 12	5½	5½	Liverpool 5 p.c. Ord.	80½—81½*b*	+½	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	102—105*b*	..	..
165,736	,,	Aug. 26	8	9	Maidstone 5 p.c. Cap.	112—117	..	..
63,480	,,	June 24	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	June 24	†6	†7	Malta & Mediterranean	5½—5⅝	..	5 1/16—5 3/32
541,930	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	78 81*	−2	81—81½
2,061,315	,,	Aug. 12	5	5	Newcastle & Gateshead Con	72½—73½*d*	+1	..
860,929	,,	,,	4	4	Do. 4 p.c. Pref.	73—74*d*	..	..
529,705	,,	June 24	3½	3½	Do. 3½ p.c. Deb.	69½—69*d*	..	..
15,000	,,	Aug. 26	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91,530	,,	,,	8 4/5	8 4/5	Do. 7 p.c.	109—114	..	..
300,000	,,	Nov. 25	7	9	Oriental, Ltd.	95 -100*	−2	97½—98
188,120	,,	June 24	7¼	7¼	Plym'th & Ston'house 5 p.c.	108—113	..	..
414,500	,,	Aug. 26	—	7/4/0	Portsm'th Con. Stk. 4 p.c Std.	102—107	..	103½
236,732	,,	,,	—	5/0/0	Do. 5 p.c. max.	78—81	..	79½
2,289,909	1	—	—	—	Primitiva Ord.	12/6—13/6	..	12/9—13/4½
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	84—86	..	85½—86
600,000	Stk.	July 22	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	+1	..
434,963	,,	—	—	—	Do. 4 p.c. Cons. Deb.	70—72	+1	..
150,000	10	Sept. 30	6	6	San Paulo 6 p.c. Pref.	7⅞—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	46—49	..	..
270,000	Stk.	Sept. 16	6	5½	Sheffield A	97—99*e*	..	..
419,968	,,	,,	6	5½	Do. B	97—99*e*	..	..
1,047,000	,,	,,	6	5½	Do. C	97—99*e*	..	..
90,000	10	June 11	4	—	South African	5—7	..	..
6,609,895	Stk.	Aug. 12	7	5	South Met. Ord.	91—93	+½	91¾—92½
1,895,445	,,	July 8	3	3	Do. 3 p.c. Deb.	57—60	..	58½
734,000	,,	Sept. 16	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Aug. 12	8½	8½	South Shields Con.	114—116*d*	..	..
1,187,795	,,	Aug. 12	6½	6½	South Suburban Ord. 5 p.c.	96—99	..	97½—98
368,817	,,	June 24	5	5	Do. 5 p.c. Deb.	92 95	..	93½
647,740	,,	Oct. 14	5	5	South'mpton Ord. 5 p.c. max	75—78	..	..
121,275	,,	June 24	4	4	Do. 4 p.c. Deb.	68 73	..	..
250,000	,,	Aug 26	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	June 24	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
120,000	,,	July 22	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	88—91	..	..
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	99—101	..	..
181,255	,,	June 10	4	4	Do. 4 p.c. Deb.	73—76	..	..
258,251	,,	Aug. 26	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	67 - 68*d*	..	..
197,294	,,	Aug. 26	6⅝	6½	Wycombe 5 p.c.	85—90	..	84
88,330	,,	,,	5	5	Do. 5 p.c. pref.	80—85	..	..
91,800	,,	,,	6⅝	6½	Do. 5 p.c. Maidenh'd	85—90	..	..
30,000	,,	July 8	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	122—127	..	..
255,636	,,	,,	7	7	Do. B 3½ p.c.	102—107	..	..
412,450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	..
852,000	,,	,,	6⅝	6⅝	Wimbledon 5 p.c.	98—103	..	..
98,000	,,	,,	7½	7½	Epsom 5 p.c.	104—109	..	..
88,416	,,	June 24	3	3	3 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *Ex. div. † Paid free of income-tax. ‡ Plus 8½ p.ct. p.a. special dividend. § For year.

In the Gas Market it is reported that prices are also hardening; but it will be seen from the table that the report is not confirmed by the quotations. It is true that the South Metropolitan ordinary and Liverpool 5 p.ct. ordinary have been marked up ½ point, and the Newcastle consolidated 1 point; but the two latter were at the local Exchanges. Inquiries made in the House on Friday, however, indicate that jobbers are expecting an early improvement. Prospective investors in gas stocks are, therefore, advised if they wish to secure the present high yield, together with the capital improvement, not to delay placing their orders.

The following transactions were recorded during the week:

On Monday, Brighton and Hove "A" 129, 130, Colonial 8 p.ct. preference 21s. 6d., Continental Union 28, 7 p.ct. preference 84, 85, Gas Light and Coke 83½, 83½, 84, 3½ p.ct. 60½, 4 p.ct. preference 76, 76½, Hastings and St. Leonards 3½ p.ct. 68, Imperial Continental 130, Montevideo 81, 81½, Primitiva 12s. 9d., 12s. 10½d., 13s., 13s. 1½d., 13s. 3d., South Metropolitan 91⅞, 92½, Uxbridge 5 p.ct. preference 84. Supplementary prices, Gas Light and Coke 5 p.ct. debenture (interest from July 18, 1926) 101, Pacific 127.

On Tuesday, Brighton and Hove 166, Commercial 3½ p.ct. 74½, Gas Light and Coke 83⅝, 83⅞, 84, 84¼, 3½ p.ct. maximum 59½, 4 p.ct. preference 76, 3 p.ct. debenture 59, Imperial Continental 130½, 131½, Portsmouth 103¾, 5 p.ct. maximum 79½, Primitiva 12s. 9d., 12s. 10½d., South Metropolitan 91⅞, 3 p.ct. debenture 58½, South Suburban 5 p.ct. 97½, 5 p.ct. debenture 93½. Supplementary prices, Bournemouth new 6 p.ct. preference, £2 paid, 45s., fully paid 11¼, Gas Light and Coke 5 p.ct. debenture (interest from Sept. 1, 1926) 100½, Kingston 100½, South Suburban 7 p.ct. debenture 102, Sunderland 6 p.ct. maximum 98½.

On Wednesday, Colonial 26s. 7½d., 26s. 9d., Gas Light and Coke 83½, 83⅞, 84, 84¼, Imperial Continental 131½, Malta and Mediterranean 5 7/16, 5½, Primitiva 12s. 10½d., 13s., 13s. 1½d., 13s. 3d., South Suburban 5 p.ct. 97½, 98½. Supplementary prices, Bournemouth new 6 p.ct. preference, £2 paid, 45s., Croydon 7½ p.ct. preference 103.

On Thursday, Aldershot 4 p.ct. preference 66, Bombay 20s. 10½d., 21s. 4½d., Commercial 4 p.ct. 78⅞, 79½, European 6⅞, Gas Light and Coke 83⅞, 84, 84¼, 84½, 3½ p.ct. 59¾, Hastings and St. Leonards 3½ p.ct. 70, Imperial Continental 130, Primitiva 13s., 13s. 3⅛d., South Metropolitan 91⅞, 92, 92½. Supplementary prices, Croydon 7½ p.ct. preference 102, Hornsey 5 p.ct. preference 85.

On Friday, Colonial Gas Association 26s. 6d., 26s. 9d., Continental Union 29, Gas Light and Coke 83¾, 84¼, 84½, 84⅝, 3½ p.ct. maximum 59, 60½, Malta and Mediterranean 5 7/32, Montevideo 80, Oriental 97½, 98, Primitiva 13s., 13s. 1½d., 13s. 3d., 13s. 4½d., 4 p.ct. 1st debentures 85½, 86, South Suburban 5 p.ct. 98. Supplementary prices, Hornsey 5 p.ct. preference 85⅞.

Satisfactory conditions existed in the Money market at the close of last week. In the absence of withdrawals for balance-sheet purposes there was an ample supply of funds, for which there was a good demand. The rates varied between 4 and 3⅞ p.ct. Treasury Bills were again allotted at a lower rate—£4 14s. 4·16d. p.ct. It is a remarkable coincidence that there has been a drop of 1s. 1d. p.ct. each week for the past four weeks. The reduction in the rate caused an easier tendency in discount rates generally.

The Foreign Exchange Markets were not so erratic last week. French francs still attracted the most attention, and there is a growing impression that the improvement has, having regard to the effect of the rise on French trade, gone far enough. The value depreciated towards the end of the week, and closed at 134⅝. Belgas were steady at 34.87½. Italian lire cheapened to 114⅞, and Sterling on New York, as indicated above, rallied to 4.85.

Silver rose to 25 7/16d. per oz. for cash, due to buying on China account. Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words), 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER.
United Kingdom & Ireland	Advance Rate:	35/-	18/-	10/-
	Credit Rate:	40/-	21/-	11/6
Dominions & Colonies & U.S.A Payable in Advance		35/-	—	—
Other Countries in the Postal Union. Payable in Advance		40/-	22/6	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Central 6055.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE, 34, OLD BROAD STREET, LONDON, E.C.2.

OXIDE OF IRON
AS SUPPLIED BY THIS COMPANY FOR OVER 50 YEARS ON SALE OR LOAN.

SPENT OXIDE
PURCHASED IN ANY DISTRICT.

Telegrams: "PURIFICATION STOCK, LONDON." *Telephone:* LONDON WALL, 9144.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works. ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

PATENTS, Trade Marks, Inventions Advice, Handbook and Consultations free. KING'S PATENT AGENCY LTD., Director B. T. KING, C.I.M.E., Regd. Patent Agent, G.B., U.S., and Can., 146a, QUEEN VICTORIA ST., E.C. 4, and 6, QUALITY CT. (next Pat. Off.), LONDON, W.C. 40 years' refs. 'Phone Cent. 682.

LESLIE ALLAN & CO., LIMITED,
RAINFORD WORKS, RAINFORD, LANCS.
BUYERS OF
CRUDE TAR. Any quantity.
Co-operative Distillation Schemes.
Sliding Scale Contracts. Fixed Price Contracts.

"LUX" PURIFYING MATERIAL.
THE PREMIER MATERIAL FOR GAS PURIFICATION.

THOS. DUXBURY AND CO.
SOLE AGENTS FOR ENGLAND, SCOTLAND, IRELAND, WALES AND THE COLONIES (except CANADA).

6, DRANSGATE, MANCHESTER. *Telegrams* "Darwinian, Manchester." *Tel. Nos.:* 8268-9 City.

PALACE CHAMBERS, WESTMINSTER, S.W.1. *Telegrams:* "Darwinian, Parl, London." *Tel. No.:* 6778 Victoria.

GEORGE WILSON GAS METERS, Ltd.
for GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS.
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER," and at 268, Stockport Road, MANCHESTER.
Telephone: RUSHOLME 976. Telegrams: "GASMETER," and 46 & 47, Auckland Street, LONDON, S.E.11.
Telephone: HOP 647. Telegrams: "GASHOUS LAMB."

SULPHURIC ACID.
SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., 86, Mark Lane, LONDON, E.C. Works—SILVERTOWN. Telegrams—"HYDROCHLORIC, FEN, LONDON." Telephone—ROYAL 1166.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815, Oldham, and 2412 Hop, London.
Telegrams—"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 248 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.

THE BRITISH GAS PURIFYING MATERIALS CO., LTD.,
99, LONDON ROAD, LEICESTER.
Telegrams: "BRIPURIMAT, LEICESTER." Telephone: LEICESTER 5096.
Solicit enquiries for:—
NATURAL BRITISH PURIFYING MATERIAL,
NATURAL HYDRATED OXIDE OF IRON,
FIRST QUALITY DUTCH BOG ORE,
BEST QUALITY BELGIAN BOG ORE,
"PREPARED" AND "UNPREPARED" ARTIFICIAL OXIDES.
SPENT OXIDE PURCHASED.
LONDON OFFICE: 34/35, NORFOLK STREET, STRAND, W.C. 2.
Telegrams: "BRIPURIMAT ESTRAND LONDON." Telephone: CENTRAL 4545 & 4546.

HUTCHINSON BROTHERS, Ltd.,
FALCON WORKS, BARNSLEY.
MANUFACTURERS OF
GAS METERS (Ordinary and Slot).
"FALCON" INVERTED LAMPS,
SQUARE STREET LANTERNS,
SUPERHEATER BURNERS, and
CONVERSION SETS for Street Lanterns.

SULPHURIC ACID.
JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Burnley, are MAKERS of Special SULPHURIC ACID ("Eagle" Brand), for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 60 years. Reference given to Gas Companies.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

WEIGHBRIDGES
FOR Motor Lorries and Railway Traffic can be seen erected at our works READY FOR DELIVERY. Inspection by your Engineer invited and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.
CHARLES ROSS, LIMITED, SHEFFIELD.

J. E. C. LORD (Manchester), Ltd., Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, &c.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C.3. Phone: Royal 1484.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C.3. Phone: Royal 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
(*See "Gas Salesman"* (*November* 24), *p.* 258.)
BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C.3. Phone: Royal 1484.

APPOINTMENTS, &c., VACANT.

HAMPTON COURT GAS COMPANY.
JUNIOR ASSISTANT AND CHEMIST.

APPLICANTS for the above Position are THANKED, and are HEREBY NOTIFIED THAT THE VACANCY HAS NOW BEEN FILLED.
C. T. PRICE, Manager.

THE York Gas Company require the Services of a Competent WORKS ENGINEER. Commencing Salary £500 per Annum, with House.
Apply on or before Saturday, Dec. 11, to H. E. BLOOR, B.Sc., B.Eng., DAVYGATE, YORK.

APPLICATIONS are invited for the post of SENIOR CHEMIST under the Northern Coke Research Committee at Armstrong College.
Applicants should have a degree or equivalent qualifications in Chemistry, and practical experience of Coke Manufacture. Salary up to £500 per Annum, according to Qualifications and Experience.
Further information may be obtained from the Secretary, to whom five *copies* of the Application and Testimonials should be sent by Monday, the 6th of December, 1926.
H. V. A. BRISCOE, Secretary of the Northern Coke Research Committee.
Armstrong College, Newcastle-upon-Tyne.

FIRM of Gas Meter Manufacturers require a First-Class REPRESENTATIVE for the North of England. He must be Experienced in the Meter Trade and have a sound Connection. Good remuneration will be paid to the right man. Only First-Class Men need apply. Replies will be treated in strict Confidence.
Address No. 7699, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

PLANT, &c., FOR SALE & WANTED.

PLANT FOR SALE.

TWO 16 ft. sq. Dry-Lute Purifiers.
Two 8 ft. square Purifiers, Valves, Connections, Lifting Gear, &c.
Modern Steam Engines and Gas Exhausters.—20,000 and 15,000 c.ft. capacity.
Rectangular Station Meters.—Fitted with new drums, 10,000 and 15,000 c.ft. capacity.
"Livesey" and "Cripps" Patent Washers.—150,000 and 200,000 c.ft. capacity.
One Cornish Boiler.—5 ft. dia. by 12 ft. long, 80 lbs. pressure, with all Fittings.
Three Tar and Liquor Storage Tanks.—6 ft. 6 in. dia. by 30 ft. long.
Full Detailed List sent on Application.
Low prices for Modern Overhauled Plant. Erection included if desired.
Firth Blakeley, Sons, & Co., Ltd.
(Second-hand Plant Dept.),
Vulcan Ironworks, Church Fenton, Leeds.
Telephone: 14, South Milford. Telegrams: Blakeleys, Church-Fenton.